Should the Customer Pay for Appliance Repairs?—
Experiences of Central Stations Together With Some Cost Data

Electrical World

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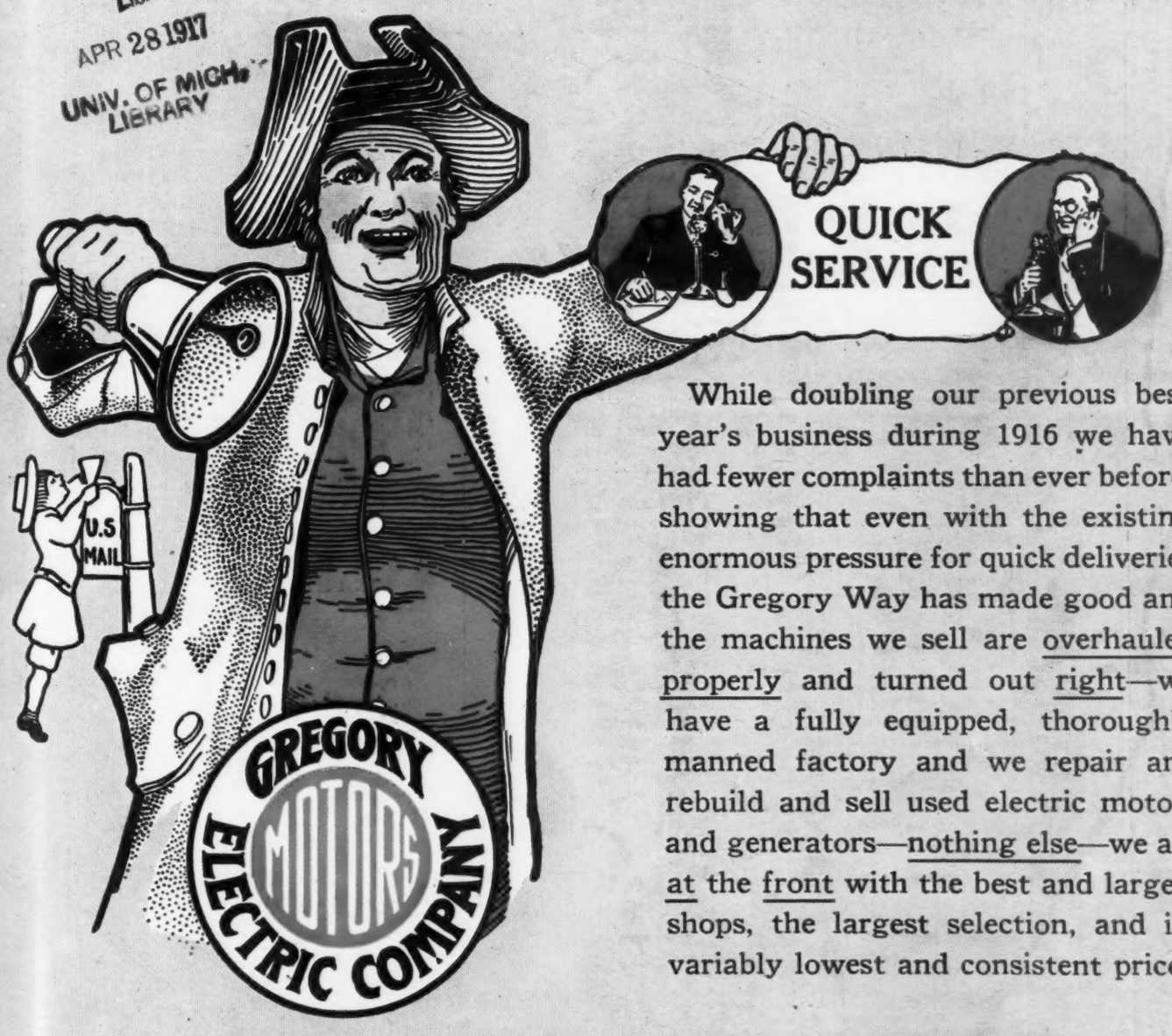


While doubling our previous best year's business during 1916 we have had fewer complaints than ever before, showing that even with the existing enormous pressure for quick deliveries the Gregory Way has made good and the machines we sell are overhauled properly and turned out right—we have a fully equipped, thoroughly manned factory and we repair and rebuild and sell used electric motors and generators—nothing else—we are at the front with the best and largest shops, the largest selection, and invariably lowest and consistent prices.

Send for our MONTHLY BARGAIN SHEET showing correct list and net prices

GREGORY ELECTRIC CO.

16TH AND LINCOLN STS. CHICAGO, ILL.

SECOND HAND ELECTRICAL MACHINERY

Weston

Why the Weston Company Makes Instrument Transformers

A few years ago, at the time the Weston Company had perfected its now world-famous group of A. C. Switchboard Indicating Instruments, it found itself face to face with a very serious situation.

The Company had developed these Instruments to the highest state of perfection, but there were on the market no transformers of sufficient accuracy and serviceability to use in combination with them! Exhaustive tests were made on all types of Transformers available in this market, and the Weston branches and representatives in foreign lands were commissioned to scour the field and send samples of the best Transformers procurable.

Not one of the Transformers thus obtained in this country or abroad met the requirements even approximately.

The Weston Company did not want to make Transformers, because of other work it deemed of greater importance; but failing to find Transformers that it could recommend to be used in conjunction with Weston Instruments with assurance of accuracy better than 1 per cent for the combination, it endeavored to have them built to special designs. Even then the results were far from satisfactory.

Realizing finally that the problem of Instrument Transformers was one that must be solved as other Weston problems had been solved, the Weston Engineering Staff thoroughly analyzed the subject and completed designs for various groups of Portable and Switchboard types of Current and Potential Transformers of a degree of accuracy and serviceability that completely met the practical requirements of switchboard practice and precision determinations in the laboratory.

These Weston Transformers established a new standard for Instrument Transformer design and construction.

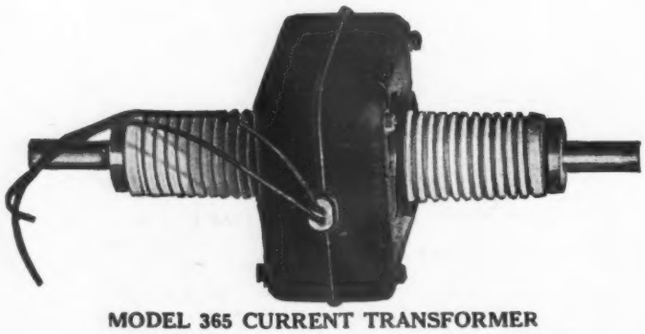
As might have been prophesied, the improvements made by the Weston Company resulted in improvements on the part of other instrument manufacturers, and this is one more instance of apparatus remaining stationary, so far as merit was concerned, until a Weston type blazed the way for betterments. The significance of this is apparent.

MODEL 312

PORTABLE INSTRUMENT TRANSFORMER

Weston Switchboard Instrument Transformers described in Bulletin 1501.

Weston Portable Instrument Transformers described in Bulletin 2001.



MODEL 365 CURRENT TRANSFORMER

For use on 13,200 Volt Circuits.

Home Office and Factory
13 Weston Ave., Newark, N. J.

New York	Chicago
Boston	Detroit
Philadelphia	Toronto
Buffalo	Montreal
Richmond	Winnipeg
Cincinnati	Vancouver
Cleveland	London
Pittsburgh	Florence
St. Louis	Paris
Denver	Petrograd
San Francisco	Johannesburg, S. Africa

Weston Electrical Instrument Co.

Electrical World

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"Better Business" the Watchword

"WE MUST insure the business success and general prosperity of the country during the war if we are to hold our present strong place among nations in the commercial competition of the future." This statement of Howard E. Coffin of the Advisory Commission of the Council of National Defense is sane, clear-visioned and necessary. The public needs such an admonition against indiscriminate economy. Our industrial forces must not lose momentum, but must be strengthened and reinforced to undertake the great service and sacrifice that the government asks. In 1914 buying stopped abruptly with the spread of the war in Europe. Markets closed, labor was thrown out of employment, expansion plans and future outlook were scrapped, and all for naught. Just how mistaken big business and little business were then is a matter of history. Our greatest industrial boom was coincident with the war, and war demands keep business active. The government asks only a discriminating economy. We should not waste food, but we should be prodigal in expenditure and output where war supplies are concerned. And "war supplies" is an all-inclusive term which embraces the great basic industries. Certainly the electrical industry has a sound commercial reason aside from the national crisis for going ahead at full speed. Business confidence is wonderfully infectious. It is our duty to be individually responsible for its increase and thus to promote a national prosperity which will best meet our national need.

The N. E. L. A. Convention

IT IS a radical change that the National Electric Light Association has made in substituting a two-day meeting in New York for the usual great annual convention. It is radical because time and need call for such action. It is a time, not for peaceful deliberation over routine problems, important though they may be, but for developing industrial efficiency to the highest pitch with the one aim of finishing the national business now in hand. The need is to mobilize every resource to carry out that purpose firmly, successfully and as quickly as it is possible to do a thorough job. The N. E. L. A., with enormous potential power in well-invested capital and trained men, is a national resource of highest rank. Brought together by patriotic spirit, strengthened and made more useful in service by the proposed conference, the industry will meet the military demand with honor and credit. President Wagner's action is a wise recognition of national urgency. It has the cordial and loyal support of the membership. The ELECTRICAL WORLD commends the new plan as patriotism of the first order. It takes pleasure in showing also that the action of the association officials receives the hearty indorsement of leaders of the industry.

The War and Electric Transportation

WAR is welding our industries into closer union. This is not the time to commercialize patriotism, but, as Howard E. Coffin has pointed out, the fact of war should not numb our senses to the need of business action.

Now is the time to investigate the relation of the industry to war conditions and to act definitely to establish a working organization to get the thing done. Some of these broader relations of the electrical industry to the war have already been pointed out. One service should be especially emphasized, first, because it offers immediate opportunity for action helpful in meeting the general problem of facilitating transportation and increasing the output of our factories, and, second, because it is the focal point of several groups in the industry.

Electricity—the electric industrial truck, the electric crane, hoist and telpher, the electric motor vehicle—is being widely applied for the handling of goods. Industrial plants in particular, and transportation companies in general, have found that electricity may take the place of human labor and cut the time of handling products within the factory and facilitate deliveries at this time when such questions are paramount. Experience abroad we may expect to serve as a basis for action in this country. Statistics recently gathered by the Electric Vehicle Section of the N. E. L. A. show that in 1914, at the beginning of the war, there were 150 electric vehicles in use in England. To-day there are 858. Gasoline cars are serving on the field of battle and "electrics" in the transportation field at home. No motor vehicle can be imported into England without a permit from the government, and no cars can be imported for commercial use except the electric vehicle. The government has taken over the railroads, and one railroad, the Midland, has purchased a hundred electric vehicles for auxiliary service. Electric transportation without tracks has increased also in Germany and Austria. Reports indicate that trackless trolley lines have been installed between industrial centers, and where the trolley ends the cars are self-propelled into the byways by batteries.

The meeting of manufacturers of electric vehicles, trucks and accessories outlined on another page has

therefore a timeliness that should result in immediate action. Every branch of the industry should support the plan to put it solidly behind electrical transportation as proposed at this meeting. Differences of opinion as to details should be forgotten in the necessary discussion of these details in working out the plan. The main facts are these: First, that local transportation and transportation methods are to receive more attention in the next few months than ever before; second, that the electric industrial truck and the electric vehicle, including the truck, the taxicab and the pleasure car, have an economic place in this problem; third, that the manufacturers of these forms of transportation and their accessories are now a part of a compact organization capable of definite action, the Electric Vehicle Section of the N. E. L. A., and, fourth, that a definite plan has now been formulated to insure constructive work.

The Electrical World has faith in the electric vehicle for transportation. Its faith is based on results accomplished in cities where co-operation is tangible and the driving force of personal action has proved that the "electric" is fundamentally sound. War will strip aside false values, and patriotism as well as business judgment will list the electric vehicle as a transportation utility. Gasoline and gasoline cars are needed for long-distance and military service. Electric vehicles thus have their inherent economic advantages for local service emphasized. The plan of action proposed at the meeting of vehicle manufacturers makes possible the correlation of all these general factors into purposeful action.

Oil-Cooled Transformers

TRANSFORMER specifications require that the temperature elevation of the windings shall not exceed a specified value under assigned conditions of load. In the case of oil-cooled transformers access to the windings by means of thermometers is very difficult, and the A. I. E. E. standardization rules require that the temperature rise of transformer windings shall be obtained by electrical resistance measurements. Ordinarily this means that immediately after shutdown the transformer windings shall be switched over to resistance-measuring apparatus.

It may easily happen, however, that even when all preparations have been made and the transformer windings are promptly switched over from the power buses to the measuring terminals some little time is lost before a measurement can be secured. Meanwhile, of course, the transformer windings are attending strictly to their business of cooling, with the result that their temperature may already have fallen a degree or two before its value can have been revealed by the measurement. Under favorable conditions, the discrepancy may be trivial, but under unfavorable conditions it may be very appreciable, and then the opportunity opens for uncertainty and dispute.

The recent A. I. E. E. paper by V. M. Montsinger, referred to in our Digest, discusses this question. One way of dealing with the difficulty is to note the time of shutdown and the time of first measurement, and also the times of subsequent extra measurements made after the cooling has become more noticeable. By plotting the measurements against time the curve may be extrapolated back to the zero of shutdown. Occasionally even this correction may be open to uncertainty, and, as a check upon it, a method of approximate calculation is recommended, in which the initial cooling can be expressed as a function of the specific dissipation in watts per pound or kilogram of bare copper in the winding. The formula promises to be a useful one.

Lighting in War Time

WE LOOK with mingled regret and amusement on the somewhat hysterical inclination to suppress all lights along our seacoast in preparation for raids of a wholly improbable, not to say impossible, character. There are very few points on the coast where a U-boat would venture to operate on the surface in face of the searchlights of the naval patrols. Actual attack of the coast by such craft is more likely to occur at gray of dawn, after the lamps are extinguished and searchlights become comparatively useless, than at night. There is little likelihood of any airship peril, in view of the fact that every plane would necessarily be lost by having to descend into a hostile country or an unfriendly sea. In the case of London, where a base for Zeppelins was within easy flying distance, extreme precautions were justified; but even there the actual damage done by repeated raids was comparatively small, despite the huge amount of explosive carried by each of the great airships.

As regards lights on the coast, lighthouses and beacons of every kind well known and serving to guide a nocturnal prowler may reasonably be extinguished. It also might be desirable to suppress the brilliant illumination of conspicuous headlands, so as to rob the shore of its familiar marks. This done, it makes little difference whether the far-spread casual lamps along the shore are lighted or extinguished, for any town of considerable size betrays its presence by a conspicuous glare in the sky, visible for many miles and serving as a far better guide than scattered lights low along the shore line. It is so easy a matter to cut off all public lighting at a few minutes' notice that if the necessity arose any coast city could be darkened as thoroughly as London has been. Experience there seems to show that so long as there is light enough on the streets by which to see the city is not dark in a military sense at all. The extreme public inconvenience of darkened streets is so great that casual risks do not justify the complete darkening of coast towns on mere rumors. And nothing except complete darkness can deceive an enemy as to the position of his sought-for point of attack. The best defense against raids on the coast is an aggressive patrol, and in reality much more is to be feared from hostile operations treasonably conducted on shore, and greatly assisted by the absence of illumination, than from any attack by sea.

Free Appliance Repairs

WHETHER or not customers' appliances shall be repaired free of charge is a question which local conditions should answer. The existing and probable future attitude of the people toward the public utility company should be a large factor in the decision, because if there is any pre-eminent advantage which accrues to a company from free appliance repairs it is one of more desirable public relations. Those who are in a position to know testify that the cost is as nothing compared with the tremendous return in good will, not to mention revenue, which the plan secures. However, if the utmost benefits are to be derived from such a policy as a means for winning public favor, a plan insuring co-operation in the actual work of repair with local electrical contractors should have serious consideration. To omit them from the scheme would be a great mistake.

Agriculture and Nitrates

THE appeal of the President for extensive and intensive agriculture is one which should be earnestly heeded. The world is in the extraordinary situation of scant crops, meager from the unfriendliness of nature and the absence of tillers of the soil, threatening to create a serious scarcity. In all those countries now war-stricken there is lack not only of workers but of fertilizers, and while at the present we are in no straits for either of these necessities, a crop shortage may come upon us, from the second cause much more probably than from the first. Germany, in particular, is reputed to be suffering seriously from lack of nitrates which can be applied to agricultural uses. The available supply is scarcely sufficient to keep the fighting fronts supplied with high explosives. If the war rises to first-class magnitude so far as America is concerned, the same stress is likely to be felt here, all the more keenly because we lack Germany's huge potash supply. It is to be hoped, therefore, that Congress will at the very earliest opportunity take measures to encourage the building of plants for the fixation of nitrogen, adding to the provisions already made in behalf of the government legislation which will give better opportunities for private plants. At the last session the water-power legislation failed, thereby putting off, as is too often our wont, the time when adequate preparation can be made. This lack ought to be remedied at once, not only for the sake of nitrate plants, but to facilitate the general supply of power, which lessens the call for human industry, not always easy to meet in time of war.

Automatic Generating Plants

OCCASIONS not infrequently arise in transmission work where it would be exceedingly desirable to operate an auxiliary station with a minimum of attendance or with no attendance at all. In the current issue J. H. Siegfried of the Pacific Power & Light Company gives a most interesting account of the way in which this desideratum was attained in a plant near North Yakima, Wash., equipped with a 1400-kw., 2300-volt hydraulically driven induction-type generator. Now, the commendable feature of the induction generator is that it is excited by magnetizing current fed from the synchronous apparatus of the system so that it gives no trouble in excitation. The frequency of the current generated is regulated by the frequency of the synchronous generators. The power delivered is proportional to that mechanically applied, and if the magnetizing current is broken the generator simply drops its load. A unit of this kind is, therefore, as Mr. Siegfried remarks, practically foolproof. It cannot be over-excited nor under-excited, nor can it be overloaded, since the waterwheel capacity is insufficient to accomplish this result. The high-tension line is controlled from the main plant through an outdoor electrically operated switch with three current transformers in its leads to work the ammeters and relays on the switchboard. Hence a plant like this can practically work without attention. A patrolman sees to it that the lubricating oil is pumped into the storage tank, takes the wattmeter readings, and reports to the load dispatcher over the telephone. He is then instructed to open the waterwheel gates until the requisite load is reached, and then the plant takes care of itself until the next visit of the patrolman. At night he closes the gates to a point indicated by the load dispatcher, and the plant operates without further ado through the night. The result of the two years' operation has been nearly 12,000,000 kw.-hr. with probably the lowest operating cost ever reached by an installation of this rating.

The Coming Issues

PUBLIC policy in a central station company, if really effective in upbuilding the property, means careful commercial management as well as public relations. In the company of average or small size the commercial and public policies are very likely to be closely merged. The manager, to be successful, should keep both before him in planning and executing. In the next issue the ELECTRICAL WORLD will publish suggestions, based on experience and long-time contact with the problem of the station of average size, which will aid in the development of business and the maintenance of cordial relations with consumers. There will also be published articles relating to regulation and to the intimate connection between financing methods and favorable public approval. Such articles help to impress the lesson that good service is not the only desirable feature of management, but that sound financing plans are of vital import. The ELECTRICAL WORLD has arranged to present in a Special Report Number, dated May 12, the reports of the proceedings of the National Electric Light Association's conference to be held in New York City, May 9 and 10, together with summaries of the work of the year contained in papers and reports of the association already prepared for presentation at the convention which was to be held at Atlantic City.

Battery Exchange Service at Hartford

A Total of Eighty-eight Electric Trucks Is Now in Operation Every Day, with an Average Energy Consumption of Approximately 1.3 Kw.-hr. per Rated Ton-Mile

FOR almost five years the battery exchange plan has been in force at Hartford, Conn., and since the beginning it has continued to grow until there are now eighty-eight commercial electric trucks of different sizes operating under this plan. No figures on return on investment or showing profits are yet available because the long life of the nickel-iron battery has made it impossible to set apart proper depreciation. Operating figures are available, and an analysis of them is given further on.

The Hartford Electric Light Company, realizing how little effort was being made by local agents to sell commercial electric cars, took the agency for General Vehicle trucks early in 1910. When snow was on the ground or conditions were otherwise unfavorable two batteries were used in some of these vehicles in the winter. The batteries were handled in individual trays and exchanges made in less than ten minutes.

This led to the evolution of the battery exchange plan, which was first announced to Hartford firms in a letter dated Nov. 1, 1911. The first car purchased for operation under this system was delivered to the Eagle Dye Works Company and went to work on June 5, 1912. All cars previously sold were changed over for operation under the exchange service as rapidly as possible.

Under the battery service system as developed by the Hartford Electric Light Company the customer purchases from the company a truck without battery while the company buys the batteries, charges them and installs them in the customer's truck. For service the customer pays a flat sum and for operation he pays on the mile basis, different rates being charged for trucks of different size.

According to the contract with the customer, the electric light company agrees to furnish him with a fresh battery on demand. The truck is brought up to the station when fresh batteries are needed, and the odometer on the truck is read, giving the company the number of miles of travel for billing. Two attendants are ready with a fresh battery, which is put in place of the one returned. The whole operation from the time the truck comes in the station until it leaves consumes normally about two to two and one-half minutes. The time lost therefore is less than the time required to fill up the gasoline tank of a gasoline truck.

The operation of changing batteries is very simple and is essentially as follows: The incoming truck is run up on a couple of slightly elevated tracks and comes to rest with the battery directly over a hydraulic lift. An attendant who is waiting slips a Cowan truck under the battery, the lift raises it to the battery, the hooks and connection of which are quickly unfastened, and the battery is lowered and taken to one side. The battery which is to take its place is all ready near by and is quickly wheeled into position, raised by the lift and the hooks, and the connection fastened. The battery box is then locked up and the truck backs out.

To perform this changing operation three men are employed, two for battery change and one shift man who reads the odometer.

The changing peak occurs as a rule between 6.45 and 8.30 a. m. From then until noon there is a let-up, depending on the weather and day. The cars commence to come faster around 11 o'clock, and from 12.30 to 3 there is a continual rush. Friday and Saturday are the two busiest days, and particularly Saturday, when the stores keep open until 9 o'clock. There is a heavy demand all day Monday, which next to Saturday is the busiest day of the week on exchange. On battery watering Monday is the heaviest day of all.

Batteries are charged during off-peak hours. When the peak comes on, or should an accident occur, the batteries are pulled off the lines.

But 1.4 Batteries Needed per Car

For the battery exchange system it has been found that 1.4 batteries are needed per car. There is therefore 0.4 of the total number of batteries always in a position to be in charge, the remainder of course being in service. For the charging of these exchange batteries forty-three charging panels are used. These are housed in the battery exchange building which used to be the company's battery substation, and even now is used as a substation to some extent. Here the company

FIGS. 1 TO 3—A FEW OF THE TRUCKS ON EXCHANGE SERVICE OUTSIDE THE STATION PRELIMINARY TO RECEIVING A FRESH BATTERY—THE MIDDLE TRUCK IS RATED AT 3½ TONS BUT IS HERE SEEN WITH A 5-TON LOAD OF COAL

also distills its own water for the batteries, using one small electric and one small steam still. The water is distilled into 5-gal. (18.95-l.) carboys, of which forty-six are in use. On the average about 100 gal. (379 l.) of distilled water is used daily. Altogether this service, with the small lighting battery business, requires the employment of about twenty-one men. Three shifts are used.

In addition to this building the company's service to truck owners includes a garage owned by the Commercial Electric Garage Company. This is a garage company through which the company bills customers for garaging and making repairs according to a contract which will be described later. The repairs are made by employees of the electric light company in their spare time at night. This garage is for night service and requires three men at work from 11 p. m. to 7 a. m.

The garage company owns the building, but all of the electric equipment is owned and operated by the electric light company. The building equipment includes charging equipment for thirty-eight cars at one time, and also a 250-kw. rotary and a 200-kw. motor-generator set. The batteries receive a fresh charge while standing idle at night.

As supplementary to the battery exchange system the company charges regularly between 600 and 700 lighting and ignition sets. A charge of 50 cents per week per battery is made. This business is not solicited but the company takes what comes in. Ordinarily these batteries stay out from two to three weeks, when the owners bring them in and receive charged batteries in exchange. The input to these batteries averages about 0.75 kw.-hr. The value of this service is that it adds additional revenue without a large portion of the additional expense that would be incurred were it operated apart from the exchange system for trucks. In fact, it helps to carry the labor necessary for the exchange service, which must be a twenty-four-hour service.

Since the exchange system was put into effect the number of trucks using it has increased materially, thereby lowering the cost of service per truck. For this reason a substantial reduction in the price of service went into effect on July 1, 1915, and the rates then made are still in effect.

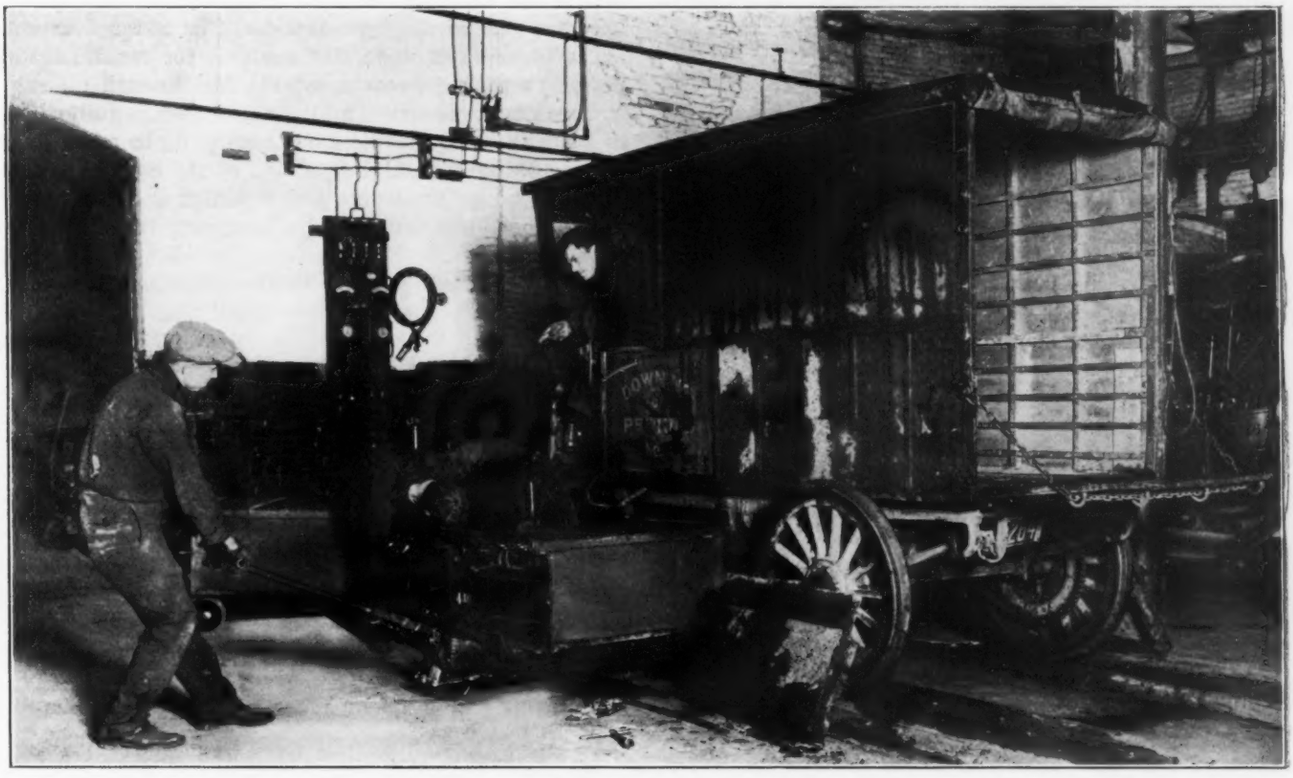


FIG. 4—IT TAKES ABOUT TWO MINUTES TO CHANGE BATTERIES. WHILE ONE MAN IS PULLING OUT THE BATTERY THE OTHER MAN READS THE ODOMETER ON ONE OF THE FORWARD WHEELS. THE FRESH BATTERY IS SEEN IN THE BACKGROUND

Rates are divided into two classes, Scale I and Scale II. Under the former the battery is not charged in the truck and the truck is stored in a place convenient to the owner with no provision for charging. Under Scale II the battery is charged in the truck at night by the company and the truck garaged by the Commercial Electric Garage Company.

The rates under the two scales are shown in an accompanying table, with old rates in parentheses. The only difference between the two scales is in the fixed charges, which it will be noticed are lower for Scale II than Scale I, the mileage rates being the same for both. The rates for cars using garage service are lower than for those with their own garage, on the principle that a smaller number of extra batteries are required to operate the service when the batteries are charged at night and do not stand idle until morning.

The garage company furnishes space for trucks under the following scale of charges based on yearly contracts: 750-lb. (0.34-metric ton) to 1-ton (0.9-metric ton) sizes, $100 a year; 2-ton (1.80-metric ton) size, $120 a year; 3½-ton (3.15-metric ton) size, $125 a year, and 5-ton (4.5-metric ton) size, $150 a year. These charges for space include ordinary oiling and greasing of trucks. Cars are washed on orders from owners at 50 cents for each washing. Repairs are made only on orders from

owners, when the charge is 60 cents an hour for labor with material and parts extra. Ordinarily repairs and replacements on the trucks can readily be made at night so that except in the most exceptional cases no time is lost by the trucks for making repairs.

Mechanical Maintenance Contract

Efforts are being made by the lighting company to sign up exchange customers under a mechanical maintenance contract. The aim of this contract as stated therein is "to keep the truck in the best of running condition at all times and at the lowest cost to the truck owner by increasing the driver's interest in the proper

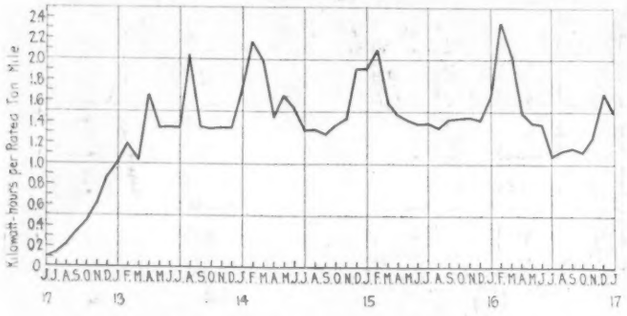


FIG. 5—ENERGY CONSUMPTION PER RATED TON-MILE

operating and care of his truck." It is this last part relating to the drivers that is of especial interest. The company uses it as part of its refund scheme. Should the amount paid by the customer at the end of each year be in excess of the repairs actually made the excess is divided as follows: 60 per cent returned to the customer; 20 per cent kept by the light company, and, provided the owner approves, 20 per cent to the driver of truck as a bonus. It is recommended that the truck owner shall pay the driver a further bonus for keeping down repair costs.

However, should the amount of repairs exceed the customer's contract price he agrees to stand for 50 per cent of the excess. The schedule on which this plan operates is: 750-lb. (0.34-metric ton) truck, $100 per year; 1000-lb. (0.45-metric ton) truck, $125 per year; 1-ton (0.9-metric ton) truck, $150 per year; 2-ton (1.80-metric ton) truck, $175 per year; 3½-ton (3.15-metric ton) truck, $225 per year, and 5-ton (4.5-metric ton) truck, $250 per year. These charges are payable in twelve equal monthly payments.

This contract is for one year and covers all bills rendered by the garage company for material and labor used in the mechanical and electrical upkeep of the truck for certain items as described and with certain exceptions. The contract includes the regular care of controller, Morse chain and motor and one overhauling. Where the truck owner does not carry accident insurance payable to the light company the latter does not agree to be liable under the contract for repairs made necessary by the wrecking of the car through unusual and serious accident. The light company is authorized to issue all orders to the garage company to make such repairs as the monthly inspection of the light company indicates to be necessary and to order such other repairs as may be found to be necessary from time to time.

Renewals of and repairs to the following items are included in the contract:

Provisions of Contract

1. The steel frame with the attached parts, such as spring hangers, battery cradle hangers, etc.
2. Countershaft case, Morse chains, housing with parts used for attaching same.
3. Springs, spring links, and bolts with bushings where used.
4. Axles, steering head forks, and spring seats with bushings.
5. Steering mechanism, complete from steering wheel to steering head, including steering pins, sector pinion and all other parts.
6. Driving mechanism—motor pinion, Morse chain, differential gear, differential, countershafts, sprockets, side chains, rear sprockets, roller bearings or other similar parts for above.
7. Brake mechanism—foot lever with ratchet, brake radius, equalizing bar, brake shoes, brake linings and brake springs.
8. Wiring—the main wiring from battery leads through controller to motor, including controller resistance and motor with all their parts; auxiliary wiring; wiring for lamps, including switches and fuses, headlight and tail-light and one inside light; glass and other parts for the lamps; the electric bulbs and sockets; bell where used with wiring and foot push.
9. Lubricating devices on all parts of the car, such as grease cups, spring link handles, etc.
10. Wheels—wheel bearings; the woodwork of wheels with the exception noted under No. 5.

It is agreed that the contract does not cover the following exceptions:

1. Items already covered under the service system.

FIG. 6—THE COMMERCIAL ELECTRIC GARAGE HAS CHARGING EQUIPMENT SUFFICIENT FOR THIRTY-EIGHT TRUCKS

2. Ordinary greasing and oiling.
3. Washing, painting of car or repairs to body of truck, including cradle doors.
4. Tires and skid chains.
5. Metal rims for tires or damage to wood felly caused by changing make of tires.

The customer agrees to keep his truck properly oiled and greased if it is kept in a place other than the garage of the Commercial Electric Garage Company.

It has been very difficult to interest customers in this plan because the customers as a rule figure that the cost involved is too high and that they can do better on maintenance themselves. Out of eighty-eight trucks sold on the exchange plan only fifteen are on the maintenance contract. The plan, however, has been in effect too short a time to procure any figures. The contract has the valuable feature of heading off unfair criticism on the part of the customer in the matter of repairs.

From the customer's point of view the larger-size trucks are best, the operation being more economical. The demand for trucks of less than 1-ton (0.9-metric ton) capacity has fallen off to a point where the company has stopped selling these smaller sizes. The new rates have increased and stimulated the sale of the large sizes.

For every truck sold a dividend is paid on each truck purchased in the previous year up to twenty-five trucks as follows: 750-lb. (0.34-metric ton) size, $4 per truck sold, with a $2 increase for each size up to 5 tons (4.5 metric tons), on which the dividend per car sold is $14.

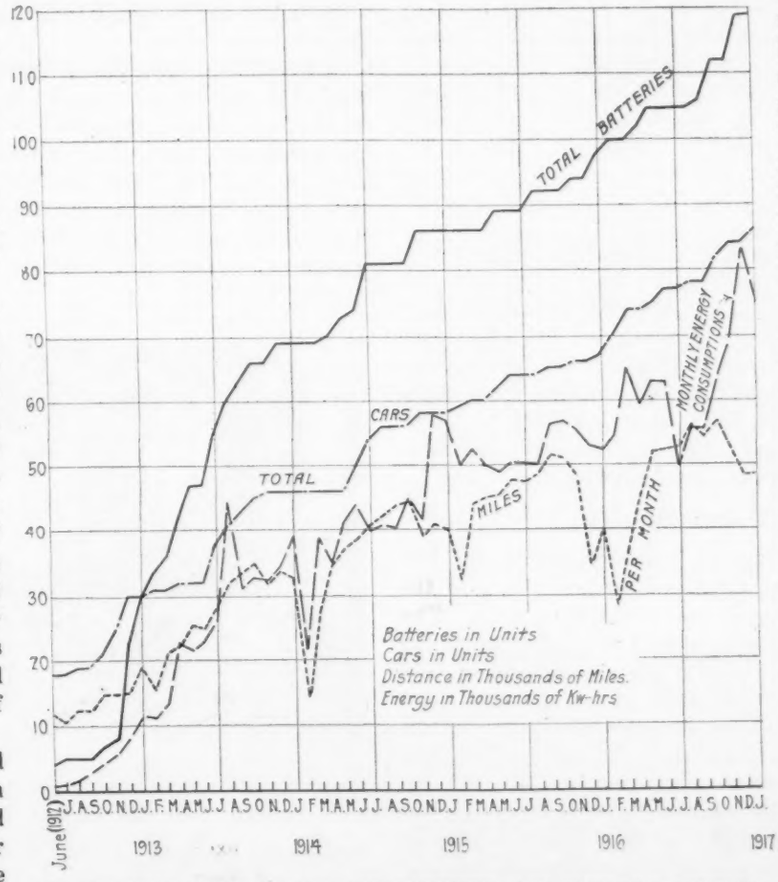


FIG. 7—TOTAL NUMBER CARS AND BATTERIES, AND MONTHLY MILEAGE AND ENERGY CONSUMPTION

CUSTOMER'S POINT OF VIEW

From the point of view of the customer the service is very satisfactory and economical in operation and maintenance. D. C. Perkins, proprietor of the business known as Downing & Perkins, draymen, who has been using the service since 1912 and has increased his number of trucks to seven, when interviewed by a representative of the ELECTRICAL WORLD was very enthusiastic. Mr. Perkins said:

"Here is what sold me the first truck. Mr. Thayer [the superintendent of the exchange system] talked electric cars to me, but I couldn't see the dollars in them. I said to him, 'Suppose I went out on a hurry-up job and the battery gave out. The car then isn't worth a cent. If you had along a pail of electricity that you could dump in the battery when it ran out, then it would be fine!' Then came the battery exchange system, and of course all objections were removed.

"About one month in the year my competitors lay up their gas cars and hire my electric cars for this service for about $150 apiece. The electric car should be taken down about once per year. It takes but a day or two. The parts are here. We don't have to send for them.

"I used to keep three horses for every two wagons. Now the horses only do short runs. No spare horses are needed with electric cars.

"I have a 1-ton (0.9-metric ton) truck that averaged 37 1/5 miles (60.35 km.) per day for two years and seven months, at a cost of $5.97 per day, including driver's pay, depreciation, interest and all other expenses. This car earned 40 per cent on the investment above all expenses, besides dispensing with a pair of horses. With the car I did all of the long runs that with a pair of horses were formerly done at a loss.

"I had a hard time getting the drivers to take hold of the electric trucks. They felt that it was a scheme for helping the boss. Now they like to drive the cars, principally because they don't have to take care of horses after they get through work and on all holidays.

"I keep a debit and credit with each car. It is up to the men to make a profit with it. This profit is divided with the men. If my men can't make a profit, I don't want them. Accidents take off profits, and I have not had an accident on an electric car in two and one-half years. The men are now eagerly watching for orders which they can fill on each trip."

Mr. Perkins is so enthusiastic that when one of his competitors has trouble he calls on him and talks electric haulage. He now has seven trucks, having purchased his first truck in 1912 and his second truck Feb. 15, 1915.

OPERATING RESULTS

Since the battery exchange system was started, in June, 1912, and up to the end of January, 1917, the total mileage was 2,009,807 miles (3,234,476.87 km.). The largest mileage in any single month was 56,402 miles (90,770.4 km.) in October last. The average miles per car per month since the plan was first started has been 678 (1091.14 km.), with the largest month that of March,

1914, when the average mileage per car was 810 (1303.57 km.), and the smallest month that of February, 1914, when the average mileage was only 309 miles (497.3 km.). It will be noticed from the accompanying table that the best mileages are obtained between March and November. The winter months as a rule show a very small falling off in mileage.

TABLE I—MONTHLY SCALE OF CHARGES UNDER BATTERY SERVICE SYSTEM

	750-Lb. Wagon	1000-Lb. Wagon	1-Ton Truck	2-Ton Truck	3½-Ton Truck	5-Ton Truck
Fixed charges:						
Scale I	$14.00 ($15.00)	$18.00 ($20.00)	$27.00 ($30.00)	$32.00 ($40.00)	$40.00 ($50.00)	$48.00 ($60.00)
Scale II	$10.00 ($10.50)	$13.00 ($14.00)	$19.00 ($21.00)	$25.00 ($40.00)	$32.00 ($50.00)	$35.00 ($60.00)
Rate per mile, cents:						
0– 500 miles	2¼	3	3½	4½	6	7
500– 750 miles	2¼	2½	3	4	5	6
750–1000 miles	2	2¼	2½	3½	3	4
For all excess above 1000 miles	1½	2	2	3	3	4

The average miles per month for the 750-lb. (0.34-metric ton) truck during the first fifty-six months was 655 miles (1054.12 km.); for the 1000-lb. (0.45-metric ton) size, 743 miles (1195.75 km.); for the 1-ton (0.9-metric ton) size, 456 miles (733.86 km.), and for the 2-ton (1.8-metric ton) size during the first forty-three months of its operation, 562½ miles (908.5 km.). The 3½-ton (3.15-metric ton) size has not been in operation long enough to make any deductions.

ENERGY CONSUMPTION

The energy consumption through January last amounted to a total of 2,252,162 kw.-hr. In 1916 the energy used for this service was 733,326 kw.-hr. The average energy consumption has been 1.12 kw-hr. per car-mile. In the winter months the energy per car-mile is large. The maximum was reached in February, 1916, with an average consumption per car-mile of 1.953 kw.-hr. In the summer the energy consumption is somewhat less.

The same general statements, of course, hold true for the energy consumption per rated ton-mile. A high consumption of 2.35 kw. per rated ton-mile was reached

TABLE II—EXCHANGE LOAD AND CARS STALLED

	1912		1913		1914		1915		1916	
	June	Dec.	June	Dec.	June	Dec.	June	Dec.	June	Dec.
Car days	†	†	†	949	1091	1432	1594	1188	1631	1770
Battery exchanges	†	†	†	703	633	1284	988	1152	1143	1623
Per cent of cars changing	†	†	†	74	58	90	64	97	70	92
Number cars stalled	†	†	†	24	12	25	3	26	16	29
Cars stalled in per cent of car days	†	†	†	3	1%	2%	⅛%	2%	1%	2%

†No data obtained.

in February, 1916. In October last, however, the energy consumption per rated ton-mile was 1.107 kw.-hr. Ordinarily, however, the energy consumption per rated ton-mile is in the neighborhood of 1.3 kw.-hr. How this consumption varies month by month is shown graphically on an accompanying curve. The figures showing energy consumption up to January, 1913, are not accurate owing to the fact that up to that time trucks were being changed over from operating with lead batteries to nickel-iron batteries and the records of power at that time are not clear.

As the service has increased the plan has become less expensive per car to the light company. In the accompanying table are shown figures representing the percentage of cars changing batteries every day and the number of cars stalled for the months of June and December, 1912, 1913, 1914, 1915 and 1916. The number of stalled cars includes every cause whatever and does not necessarily imply a condition of exhausted batteries.

The energy used is measured by wattmeters and includes all losses incurred in transformation and stepping down.

The Edison batteries used on the exchange service are subjected to very hard usage. At the end of the first four and a half years the number of cells in use was 6936 and their service was equivalent to 226,812 cell-months. Only 225 cells have been returned to the factory for repairs in that period. Of these fifty-one were on account of leaks or broken seams and the rest for other causes, such as failure to charge up or broken terminals.

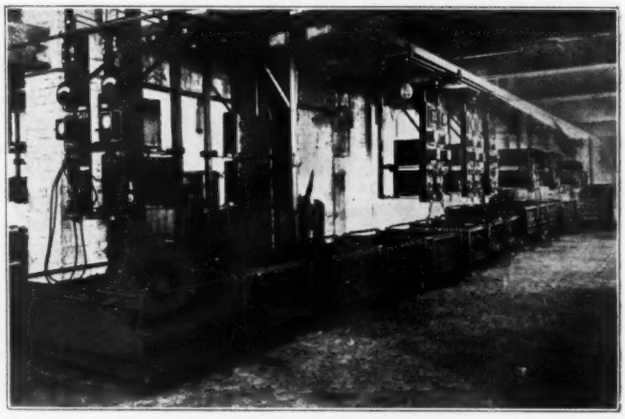


FIG. 8—OF THE 1.4 BATTERIES NEEDED PER TRUCK, 0.4 IS ALWAYS IN A POSITION TO BE CHARGED IN THE CHARGING PLANT, A CORNER OF WHICH IS HERE SHOWN

Since the exchange service was first started in Hartford it has been under the personal direction of Willis M. Thayer, who presented a paper on the experiences of the company with the system before the 1915 Electric Vehicle Association convention, which was held at Cleveland, Ohio.

The first electric truck sold by the Hartford Electric Light Company is still in use by its original purchaser, the Boston Branch Grocery, and this firm is now operating eleven electrics under the battery service system. The trucks are used in twenty-five lines of business, and sixty-three out of the eighty-eight have been purchased on repeat orders. The trucks sold have proved more advantageous than either horses or gas cars, and this advantage is principally one of economy. That is, in spite of the high first cost electric vehicles have proved economical. If the electric truck could be sold to the customer at a price corresponding to that of the gas truck and its excess investment cost distributed as an operating cost electric trucks would sell more rapidly. This result is in part attained through battery service. A wider distribution of charging facilities is also to be desired.

Experience with Induction-Generator Plant

Description of the Pacific Power & Light Company's Drop Plant in the Naches Valley, Which Has Been in Successful Operation for Two Years Without an Attendant

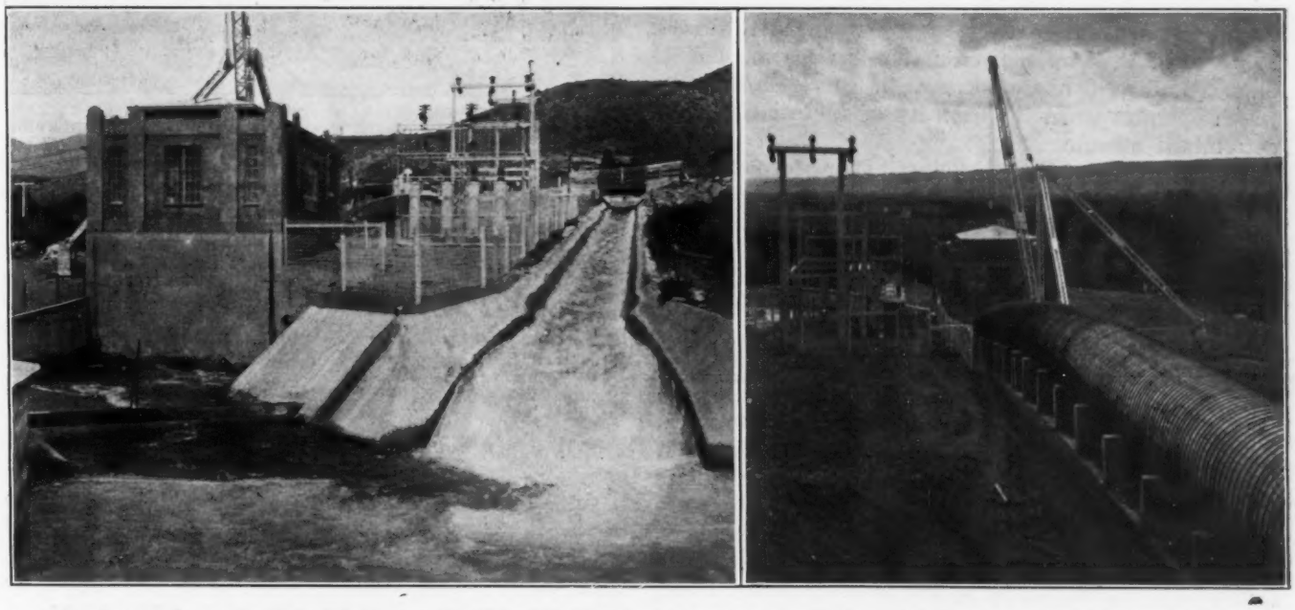
BY J. H. SIEGFRIED

Superintendent of Power, Pacific Power & Light Company

SEVERAL interesting features are connected with the construction and operation of the Pacific Power & Light Company's induction-generator plant, in the Naches Valley, 15 miles (24.1 km.) northwest of North Yakima, Wash. The Wapatox ditch, which supplies the plant with water, was built for irrigation purposes, but later was acquired by interests which enlarged it and extended it for power purposes. The canal is 9.4 miles (15.1 km.) long and supplies the Naches power plant with water under a head of 147 ft. (44.8 m.). Along the canal were several small falls, aggregating 52 ft. (15.8 m.), where power was wasted. In 1913 the canal was enlarged and lined with concrete its full length, and all falls were concentrated at one point near the middle of the canal, where a new plant (the Drop plant) was installed and put in operation, in the spring of 1915. The end of the canal at the upper level was enlarged to form a forebay, and trash racks, headgates, spillway, etc., were installed, as shown herewith.

Because the plant stood in the middle of the canal it was necessary to provide some means for carrying the water around it during the periods of light load or when the plant was shut down for any purpose. This was accomplished by providing a wasteway between the upper and lower levels of the canal and arranging a spillway at the forebay of such a length that the entire capacity of the canal could be spilled with a 12-in. (0.3-m.) rise of water in the forebay. Since the lower and upper levels of the canal are only 500 ft. (152 m.) apart, the wasteway had to be given a steep slope. As a result the problem of dissipating the kinetic energy of the water at the lower canal level was presented. Several different methods of solving this were considered, but the one finally adopted has proved very successful. The end of the canal below the plant was enlarged to form a "stilling" pool 20 ft. (6.1 m.) deep, 50 ft. (15.2 m.) wide and 102 ft. (31.1 m.) long. The sides and bottom were made of reinforced concrete, as was the apron at the end of the wasteway When not used through the waterwheel the water rushes down the wasteway into the stilling pool, where it rolls and churns until its kinetic energy is lost, after which it flows quietly out of the pool and into the lower section of the canal.

The forebay is triangular in form and is connected with the canal at its apex. The north side of the forebay is formed by the spillway wall, and one-half of the east side is occupied by an ice gate 35 ft. (10.7 m.) wide. From the end of the ice gate and parallel to the spillway wall extend the trash racks, consisting of eight panels of grates 8 ft. (2.4 m.) wide and 10 ft. 6 in. (3.19 m.) high. Thirty-five feet behind the grates are the headgates. Two gates, each made of a steel frame filled with concrete to give it weight, are provided. They are operated by a chain hoist, and the bearing surfaces have rollers and a flexible metal strip which serves as a seal alongside the gates. After passing through the grates and gates the water enters a cone-shaped chamber which connects with a steel pipe that leads to an 8-ft. (2.4-m.) wooden penstock. The penstock rests on concrete saddles, the spaces between being provided with a concrete gutter to catch the water in case leakage should occur. At the lower end of the penstock is a steel thimble which is connected with a butterfly valve placed inside the power-plant building.



FIGS. 1 AND 2—INDUCTION-GENERATOR PLANT FROM DISCHARGE END OF WASTEWAY, AND PIPE-LINE SERVING WATERWHEELS

The power house consists of a steel framework cov-

ered with metal lathing, plastered inside and having a stucco finish outside. The building is 29 ft. by 30 ft. 6 in. (8.8 m. by 9.3 m.), is well lighted and is equipped with a hatch in the roof through which the machinery can be handled by means of a 70-ton (63.5-metric ton) stiff-leg derrick permanently erected near the building. The derrick also serves the outdoor high-tension transformers and lightning arresters.

THE INTERIOR EQUIPMENT

Inside the building are a waterwheel-driven generator and a switchboard. The waterwheel is a vertical Pelton-Francis unit which develops 1900 hp. at 200 r.p.m., and the generator is a 1400-kw., 2300-volt, three-phase General Electric induction-type unit. The weight of the revolving element is supported by a Kingsbury thrust bearing above the generator. Between the top of the generator and the hatch in the roof is a sheet-iron housing in which was placed a fan for forced ventilation. This fan is not needed, however, and has been disconnected. The waterwheel is not equipped with a governor, but is controlled by means of a large hand-wheel geared to the waterwheel gates.

The generator panel is equipped with a voltmeter, an ammeter and indicating and integrating wattmeters. The generator oil switch is of the General Electric K-12 type and is equipped with no-voltage release and overload trip. A tachometer is provided for indicating the speed of the unit when starting. The level of water in the forebay is indicated by a voltmeter, the scale of which is calibrated in inches.

A 400-gal. (1514-l.) oil storage tank is installed near the roof of the building, and the oil is carried through sight feeders to the Kingsbury thrust bearing and to the guide bearing. Overflow from the bearings flows by gravity to a sump tank, inside of which are filters. The oil is pumped from the sump to the storage tank by means of a motor-driven rotary pump. The storage tank is provided with an indicator showing the amount of oil it contains. Connected therewith is an electric alarm which operates when the quantity of oil reaches a predetermined amount.

Three 500-kva., 2300/38,000-volt transformers connected delta on the low-tension side and star on the high-tension side are provided to feed the 66,000-volt high-tension system. The line connecting them with the system is 2.9 miles (4.6 km.) long and consists of three No. 4 stranded BB steel conductors arranged in an equilateral triangle 6 ft. 6 in. (1.97 m.) on a side. This line is controlled from the Naches plant, where all power generated at the Drop plant is passed through a General Electric K-22 outdoor-type electrically operated switch equipped with three current transformers in its leads. These actuate the ammeters and overload relays on the switchboard of the Naches plant.

As is well known, an induction motor driven above synchronous speed will act as a generator when connected to a system fed by synchronous generators and will deliver power to the system in proportion to the force driving it. The frequency of the current produced will depend on the frequency of the synchronous generators connected to the system. Excitation of a generator of this type is produced by the wattless magnetizing current drawn from the synchronous generators or condensers connected with the system, so it is evident that an induction generator will lose its load should the wattless magnetizing current be interrupted.

The generator at the Drop plant is of this type and is practically fool-proof. It cannot be over-excited or under-excited by any action of an attendant and cannot be overloaded because the waterwheel capacity is less than the capacity of the generator. It cannot be burned out by means of short circuits outside the generator, for the reason that a short circuit will interrupt the magnetizing current and thus prevent the production of any emf. Furthermore the voltage or frequency of the system will not change as long as synchronous generators equipped with governors are operating on the system.

On account of these characteristics this plant is operated without an attendant. The canal patrolman stops at the plant in the morning, pumps the oil into the storage tank, takes the wattmeter readings and reports them to the load dispatcher at Kennewick. The load dispatcher then instructs him to open the waterwheel gates until the load desired is obtained, after which the machine is allowed to run without attention until the patrolman passes the plant again. At night the patrolman is instructed to close the gates and reduce the load to a point determined by the load dispatcher, after which the generator is left to run all night without attention.

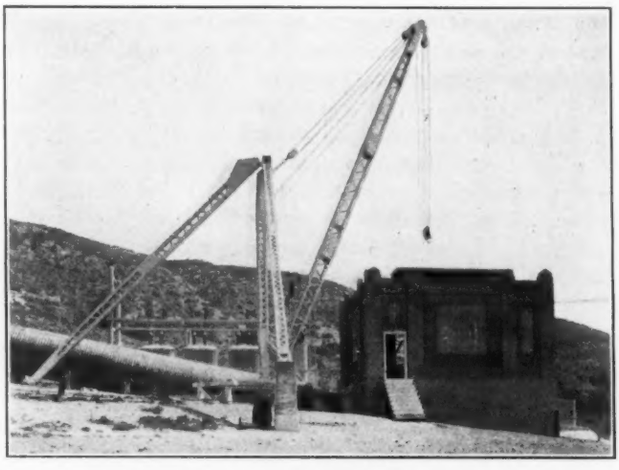


FIG. 3—PERMANENT OUTDOOR CRANE FOR HANDLING STATION APPARATUS THROUGH ROOF HATCH

This machine has been operating in this way without trouble for almost two years and in that time has generated 11,700,000 kw.-hr.

To put this unit in service after a shut-down, the waterwheel gates are slowly opened until the machine has reached approximately normal speed. In order to tell when synchronous speed is reached a stroboscopic indicator is provided. This consists of an arc lamp fed from the circuit to which the generator is to be connected and a series of black and white stripes on the generator shaft, the number of stripes corresponding to the number of poles of the generator. The arc lamp is placed inside the frame between the generator and the waterwheel. When the lamp is energized and the light shines on the striped shaft the stripes appear to move slowly ahead or back, depending on whether the generator is running above or below synchronous speed. When the stripes appear stationary—that is, when synchronous speed is attained—the attendant closes the generator switch. It has been found in actual practice, however, that less disturbance occurs on the system if the switch is closed when the generator is running slightly below synchronous speed.

The transmission system with which this plant con-

nects has 300 miles (482.8 km.) of 66-kv. and 112 miles (180 km.) of 25-kv. lines. The load is relatively light and the power factor of the system is leading except during the heaviest demand for power, which occurs in the irrigation season. The handling of the charging current of the system has been a problem on account of the lack of generator capacity at certain periods of the year when ice prevents normal operation of the hydraulic plants. The addition of the Drop plant generator has been of considerable benefit, however, for the reason that it requires 825 kva. for its magnetization. This is supplied from the lines of the high-tension system and relieves the synchronous generators to this extent. In the winter when ice prevents the operation of this unit by water the generator is allowed to run as an induction motor for the purpose of using the charging current.

If at any time the synchronous apparatus should be tripped off the system the induction generator will still maintain voltage on the system and carry load. The frequency and load is proportional to the waterwheel gate opening, while the voltage will depend on the length of line fed by the generator and the voltage of the system at the instant the synchronous apparatus was tripped off. If under these conditions the waterwheel gate setting is changed, the load voltage and charging current will change with the frequency.

Under certain conditions this generator will trip off the line and it is necessary to get into communication with the canal patrolman and send him to the plant to put the generator in service. This may appear to be a great disadvantage, but the patrolman's beat covers only four miles—one mile above and three miles below the Drop plant—and telephones are installed every mile along the canal. The patrolman reports to the forebay tender at Naches from each telephone station and is therefore fairly close in touch with the system at all times. At night he sleeps in a house near the forebay and can be reached by telephone at any time. From the time the generator is tripped off the line to the arrival of the patrolman at the station the generator speeds up, but as the machine is designed to withstand 100 per cent overspeed no damage can result. This plant has given excellent service at an extremely low operating cost.

PROFITABLE UTILIZATION OF WASTE MATERIAL

How the Public Service Company of Northern Illinois Attacks the Problem Presented by the Junk Pile

Probably no line of business is more seriously affected by the high cost of raw materials than the electrical industry. Recognizing this condition the Public Service Company of Northern Illinois has endeavored in all the branches of its organization to utilize waste materials or make it a point to dispose of them to the best advantage. In doing so, however, care is taken not to let the expense of selling or utilizing the material offset the price obtainable.

According to George R. Jones, purchasing agent of the company, the largest waste is by way of the junk pile. Selling this in job lots as is usually done brings a small price based on the least expensive materials in the pile. Higher prices are obtained by segregating the scrap into the following divisions: (1) Cast iron; (2) wrought iron; (3) malleable iron; (4) forge iron; (5) steel (tool steel should not be deposited in scrap piles); (6) cutting stock—(a) busheling (0.25-in. gage or heavier), (b) busheling (sheet iron); (7) borings and turnings (must contain no brass to avoid defective pigs); (8) usable pipe; (9) usable fittings, and (10) usable flues.

Copper and brass, except for wire and cable, are kept under lock and key and sorted as follows: (1) Red brass and bronze; (2) yellow brass; (3) red borings and turnings, and (4) yellow borings and turnings. When weatherproof wire and cable can be burned without losing an appreciable amount of copper this method of reclamation is employed. The ashes are usually saved as they contain copper flakes. The lead sheathing is stripped off large scrap cables so the copper can be sold separately, the lead being turned over to the gas department for calking pipes. Some of the lead is used for making expansion bolts. Small cable cannot be disposed of so profitably, however, as it has to be sold unseparated. The price obtained is approximately equal to the junk value of an equal amount of lead.

PLAN FOLLOWED WITH OLD MACHINERY

Before selling old machinery the amount of copper contained therein is computed to determine whether it will be advisable to separate the apparatus into its constituent materials or sell it as an operating unit. Transformers are never junked without their being tested first by the electric-service company and then by the manufacturer receiving them for repairs, to make doubly sure that they cannot be repaired and are not inoperative owing to manufacturing defects. Many thousands of dollars have been saved by this policy.

When meters are junked or returned to the manufacturers for credit, all parts are removed that are in good operating condition for use in repairing regular stock meters. Junk regulators and arc lamps are sold without separating the copper, iron and brass in them. Since some of the old series incandescent lamps have aluminum hoods these are sold separately as they command relatively high prices.

The solder on junk cable and the dross of molten lead are saved for future use. This dross, as well as babbitt dross, is readily marketable. All sorts of copper wire, even magnet wire, are saved for resale. Enough is reserved, however, to avoid the use of new copper wire for the tie wires.

All incandescent lamps that are turned in for renewals are saved. Those units which have been returned for reduction in candlepower are used in the generating stations. The remainder are sold to lamp-refilling companies, or the constituents sold separately. The bases can be sold for the brass or platinum filament supports they contain. The glass of which the bulbs are composed is high grade and brings a good price.

As the price of mercury has traveled a sky-rocket course since the war began every bit of quicksilver is jealously guarded. When rectifier tubes become useless the mercury is extracted and the bulbs returned to the manufacturers for the credit the platinum terminals and glass will bring. Rubber is another valuable part of the scrap pile. Since different forms of it bring different prices it is separated and classified as follows: (1) Tire casings; (2) inner tubes—lineman's protector shields; (3) hose; (4) gloves; (5) boots; (6) coats and slickers; (7) packing, and (8) hard rubber.

Who Should Pay for Appliance Repairs?

What the General Central Station Experience Has Been—Why Some Companies Charge and Some Do Not, and What It Costs—Data from Twelve Cities of the Middle West

A NEW and interesting problem of central station policy is rapidly developing with the growing use of small appliances in the household. For the last five years and more the aggregate number of these devices in use has been increasing by tens of thousands annually—yes, and by hundreds of thousands to-day—and as they are used they are subject to inevitable wear and tear. Enters the problem of repairs. From a small detail of commercial policy it rapidly is becoming a most important factor in the maintenance of an appliance load. In twelve cities in the Middle West, ranging in population from 2000 to 2,000,000 and totaling over 4,200,000 inhabitants, investigation shows that one repair was made last year for every thirty-one people in these communities. In nine of these cities the central stations made all of these repairs without charge to the customer—they believe that all such service should be free. In the other three cities a charge is made. The question arises therefore, which is the proper policy for the central station to pursue?

Why Some Companies Favor Free Repairs

S. B. Way, vice-president and general manager of the Milwaukee Electric Railway & Light Company, says: "We are convinced that a liberal policy respecting heating appliance repairs is good business. Heating appliances out of repair are of no value, and our efforts are directed toward keeping them in continuous use and keeping the customers satisfied with the results. About 8000 free electric appliance repairs are made in Milwaukee annually, and the cost of these repairs will average about 50 cents each. The free repairs constitute about 90 per cent of the total repairs to electric heating appliances, and the remaining 10 per cent are charged to customers for various reasons."

R. E. Flower, manager of The Electric Shop, which is the appliance department of the Union Gas & Electric Company of Cincinnati, agrees. He writes: "We have always given free repairs, and we feel that this policy has won us many friends. In the twelve months ended Dec. 31, 1916, we repaired 1170 appliances, of which about 60 per cent were repaired in our shop. The expense of making the repairs was $1,017.50, which makes the average cost 87 cents per repair." He feels that it is worth what it costs.

The Des Moines (Iowa) Electric Company, serving a city of 86,000, also sees the problem in a liberal light. H. W. Garner, the commercial manager, says: "The gratis repair department is expensive to maintain, but we believe that it is good policy and have no idea of discontinuing free service. We only ask the customer to bring his appliance to our office and to call for it. During 1916 we repaired 3450 flatirons and 463 miscellaneous appliances. The cost of making the repairs on the 3913 pieces was 58 cents each, which included labor and material."

While it does not operate on an entirely free repair basis, the Kansas Electric Utilities Company at Emporia, Kan., is also convinced of the fundamental correctness of the plan. M. Dunsworth, the local manager at Emporia, says: "In our opinion it not only keeps appliances in use and gives us the benefit of additional energy consumption, but also forms a friendship between the company and the consumer. When we show that we are interested in such matters it cannot but have a good effect on our public.

"We repair on an average about sixty electric irons and small heating devices per month. We make an average charge of 15 cents for labor, ample to cover repairs on irons and small heating devices. A charge of 25 or 30 cents is sufficient to cover the labor of repairing vacuum cleaners."

The Experience in Chicago

And in even smaller cities, of which Union City, Ind., with population of 3200, is a fair example, the same policies have been found profitable. "We have made it a custom," says Thomas T. Parker, manager of the Union City Electric Company, "to repair at actual cost for material all appliances, whether purchased here or elsewhere. We believe this plan is eminently fair to the customer, that it is good-will advertising, and that it helps very materially in keeping appliances in use." But in Chicago the central station officials have tried it out exhaustively and after giving free appliance repairs for years have decided to revise their policy. Their reasoning is interesting.

The Commonwealth Edison Company during 1913 repaired 28,144 heating devices; in 1914 the number increased to 48,880; in 1915 it was 59,351, and in 1916 it was 71,601. To show what the majority of repair jobs consist of, the following classification of jobs done in the shops in 1916 was given by P. J. Smith, who is in charge of the customers' service department: Cords, 30,889; irons, 14,907; percolators, 1302; toasters, 615; curlers, 803; heating pads, 272; stoves, 88; water heaters, 34; grills, 56; Christmas tree outfits, 27, and miscellaneous heating devices, 406. This gives a total of 49,409 repairs effected in the company's shops.

Of course the cost of making these free repairs in Chicago has grown from year to year. In 1915 the total cost was $18,000; in 1916 it was $27,835, and estimates show that the company receives about three time the amount of gross revenue per year from repaired appliances that it costs to make the repairs. About one-third of the cases that are cared for by the trouble-men who handle household calls were these free appliance repairs, about one out of every four customers being affected. The Commonwealth Edison policy, however, has recently been changed, and from now on a net charge of 50 cents will be made on all cord repairs, which will be accomplished by charging $1 per cord, allowing a credit of 50 cents for an old cord returned with the fittings of each end. In other words, the volume of the repair work has passed the point where it is considered expedient to make no

charge for it, and it is believed that the service should begin to pay its way.

OTHER COMPANIES THAT CHARGE

And this point of view is shared by many other companies. The United Electric Light & Power Company of New York City charges all repairs at cost where they are not covered by the manufacturer's guarantee. The Syracuse (N. Y.) Lighting Company charges cost on labor and material. The United Electric Light Company charges cost plus a slight amount for delivery, though it does not sell appliances itself. Its reasoning is well expressed by C. R. Phenicil, vice-president of the Wisconsin Public Service Company of Green Bay. He says: "We do not feel that it is proper to render such service free of charge, but believe instead that each class of service furnished the customer should bear its own proper portion of the total expense of conducting the business. Any other practice leads most surely to discrimination. Moreover, we have found that when customers maintain their own heating appliances they are more careful not to abuse them."

Surely it is to the interest of the central station that the appliance be in good repair and stay in use, but it is dangerous for the idea to prevail that the electric company is responsible for everything that happens to an energy-using device. When a free service of this kind is offered to the consumer with appliances on circuit there is an element of rate discrimination against his neighbor who, using none, receives no benefit and pays the same rate. There seems to be a steadily increasing opinion, therefore, that the time has come for every manager to investigate this cost of free appliance repairs and find a way to apportion it equitably in charges for the class of repairs that well may pay their way, leaving only the minor "fix-it" cases that really should be handled without charge, in the spirit of good service, to be charged against the benefit of a prompt return of the appliances to active service.

And to this J. E. Worth, commercial manager of the Springfield (Ohio) Light, Heat & Power Company, adds: "We do not believe in a free repair policy because we do not feel that it is necessary. It is my opinion that the business of a public utility company is just as legitimate as any other business, and the sooner companies rid themselves of the idea that it is necessary to continue making donations to the customer the better it will be for the business generally." But Robert Montgomery, commercial manager for the Louisville (Ky.) Gas & Electric Company, goes further and maintains that this whole function of appliance repairs belongs rightfully to the dealer and should be left there.

THE ALLENTOWN SCHEDULE

From a review of a very sizable pile of letters from central stations that have expressed themselves as to their experience and opinion in the matter, however, the trend of practice seems to be fairly well defined, and it is a middle course. It is recognized that it is profitable to keep appliances in use, which means in good repair; but on the other hand the customer is always willing to pay his way if the case is put before him clearly, and he appreciates and approves a liberal policy which offers "service" free but still expects him to pay for labor and material that entail direct expense to the company. To this end the Lehigh Valley Light & Power Company of Allentown, Pa., has a rather indefinite schedule, which aims to eliminate "red tape" and serve the customer yet reduce somewhat the burden of repair expense. Its policy is as follows: (1) Minor repairs requiring no material, no charge; (2) minor repairs requiring material, charge for material; (3) extensive repairs, charge time and material; (4) defective cords, other than at ends, if in service a reasonable length of time, charge for cord; (5) unsatisfactory toaster or flatiron, ascertain cause and remedy trouble, usually no charge; (6) guarantees at time of sale, transmit to customer any guarantee made by manufacturers.

As all heating appliances are put out on liberal trial periods, the customer is urged to be thoroughly satisfied before purchasing, and this eliminates any special necessity for guarantee, considering the general policy.

Of course such a policy will constantly develop those "border-line" cases where the decision must be made in the spirit of fairness and good service, and many expedients for fixing this border line are suggested. The Texas Public Service Company repairs all appliances gratis that have been sold from its own offices, but charges on devices purchased elsewhere. The Arkansas Valley Railway Company of Pueblo, Col., gives repairs free up to one hour's time with a reasonable amount of material. The Chattanooga (Tenn.) Railway & Light Company makes no charge for labor, but does charge for such parts as the customer can readily see entailed some expense, and in 1916 the material still given away amounted to $599.78. The Metropolitan Electric Company of Reading, Pa., charges for new cords or major parts, but not for minor repairs. The Virginia Railway & Power Company of Richmond makes without charge such repairs as can be cared for by its own trouble-men, but refers more serious repairs to dealers. The Toledo (Ohio) Railways & Light Company has discontinued all free repair service.

Against this we find a considerable number of companies which have recently adopted a service of free repairs to household appliances or extended its application, among them being the Kansas Gas & Electric Company of Wichita, the Union Electric Light & Power Company of St. Louis, Mo., and others. One finds the Edison Electric Illuminating Company of Boston entirely satisfied that this is a service worth its cost. And there may be found many combination gas and electric companies holding to the policy in part because such maintenance is partly standard practice in the gas field. But there seems to be a growing opinion in the industry that the idea of free repairs, like the sale of the appliances themselves below cost or without a proper profit, is not good business.

Surely it is to the interest of the central station that the appliance be in good repair and stay in use, but it is dangerous for the idea to prevail that the electric company is responsible for everything that happens to an energy-using device. When a free service of this kind is offered to the consumer with appliances on circuit there is an element of rate discrimination against his neighbor who, using none, receives no benefit and pays the same rate. There seems to be a steadily increas-

ing opinion, therefore, that the time has come for every manager to investigate this cost of free appliance repairs and find a way to apportion it equitably in charges for the class of repairs that well may pay their way, leaving only the minor "fix-it" cases that really should be handled without charge, in the spirit of good service, to be charged against the benefit of a prompt return of the appliances to active service.

GROUNDING TRANSFORMER CASES AS A PROTECTIVE MEASURE

Value of This Method in Reducing Damage from Lightning Storms—Is the Lineman's Hazard Thereby Increased?

BY J. C. RUTHERFORD

Grounding the cases of distributing transformers has been mentioned occasionally in a vague sort of way as a means of protecting the apparatus against lightning. In addition there has been some discussion as to whether a grounded case will or will not increase the hazard to linemen.

Theoretically, grounding the transformer case of a pole-type transformer should be effective as a means of protection, as a little reasoning will easily show. It is not of extreme importance that the potential due to the lightning discharge between winding and ground be kept down to a comparatively low value. On the other hand, it is of vital importance that the potential difference existing between the primary and secondary should not exceed a value much in excess of that for which the transformer is designed—a few thousand volts. If the lightning arrester be connected between line and case, and, further, if the case be connected to ground, the above result will be accomplished; namely, a limitation is placed on the potential difference between primary and case or the secondary, which, so far as insulation is concerned, may be considered as the equivalent of the case. As still further tending to assist the discharge of potential it has been suggested that the secondary be connected to the case through an air gap.

Should a lightning discharge occur with the above arrangement the potential of the transformer may be several thousand or even several hundred thousand volts above earth or ground, whereas the primary and secondary are at a difference of potential of only a few thousand volts. Connecting a transformer case to earth makes the lightning protection independent of earth resistance and reduces the effect of the impedance of the ground wire between arrester and ground. It will be observed further that the actual benefit that one may expect to derive from connecting arrester and case together will vary somewhat, and will be greatest where high-resistance earths only can be obtained and where the ground wires are long. The usual length of ground wires is about 30 ft. (9 m.), sufficient to offer quite a high impedance to a high-frequency discharge.

The question of life hazards is one that cannot be ignored when the advisability of grounding transformer cases is under deliberation. Grounding the cases does increase the life hazard, or may do so, and it is this fact, coupled with the additional cost of line work incidental to grounding and the absence of definite proof that doing so is efficacious, that has acted as a strong deterrent. Linemen often work on 2300-volt circuits alive, trusting to the insulating properties of the pole to protect them from shock. Where ground wires run down the poles most companies cover them with wood molding with a view to protecting the men from coming in contact with a grounded conductor. The presence of a grounded transformer case, which covers a far greater amount of surface than the small ground wire, must, therefore, constitute a greater risk than does the ground wire. The obvious way to overcome this difficulty is to install some form of link-switch between the transformer case and the ground wire, so that men working on the pole may open this switch and isolate the transformer case, should they desire to do so. As an additional precaution linemen employed on systems adopting the grounded transformer case should be especially warned of the increased hazards existing.

While theory tends to show that grounding transformer cases should be efficacious in protecting the transformer windings the results in practice have not substantiated the theory, actual operating data being negative rather than conclusively positive. The added expense, complication and danger to linemen resulting from such practice also tend to deter the grounding of cases even where the results are beneficial in other ways.

Another practice is being followed in some places that has afforded satisfactory protection, and that is the use of external reactance coils. Reactors have been used for many years on large outdoor and indoor apparatus, but not to the same extent for distributing transformers. The reactance coils have been placed between the transformer cut-out and line, thereby protecting both cut-out and winding. The reactors do not have to be large coils nor do they have to have large spaces between turns. About twelve to fifteen turns of No. 10 or No. 8 rubber-covered wire seem to suffice. In one instance at least the use of reactors has reduced lightning troubles 70 per cent, it is claimed.

The installation of lightning arresters upon the same pole as the transformer is recommended by the N. E. L. A. "Handbook of Overhead Line Construction," and is obviously the correct practice. The elimination of transformer tops and terminal blocks has been proved advisable by D. W. Roper of the Commonwealth Edison Company. The use of reactors should prove of further efficacy. From an economic viewpoint, their value will depend upon the severity of the lightning, value of continuity of service, cost of repairs, etc. The needs of distributing transformers in the way of protection and the ability of the various methods of protection to accomplish their function are now well known. Any one of the protective measures involves the expenditure of money and time, but probably the simplest is the reactance coil.

Improved Wireless Ammeter

A Marconi patent, No. 1,220,833, in the name of H. A. Ewen, shows an extremely sensitive mounting for a hot-wire instrument that suggests bifilar suspension.

According to the inventor, an arm or indicator is so mounted that the only movement of which it is capable is rotation in a plane around its axis subject to the controlling force of a spring. The latter is connected to one end of a stretched current-carrying filament the other end of which is connected to a support that is substantially parallel to the axis of the arm. Thus with a small contraction or expansion of the filament considerable rotation of the arm will be allowed.

Motion Picture Studio Lighting Layout

Description of Gas-Filled Lamp Installation Using Two Types of Lighting Frames, One Suspended from Overhead Trolley and the Other Adapted to Move Around on Floor

WHEN "movie stars" come as high as $670,000 per annum the producing company can ill afford to have working hours influenced by the vicissitudes of weather, even in southern California, where the normal year contains 316 sunshiny days. Lighting installations suitable for producing moving pictures on a large scale indoors have recently been installed at most of the larger studios, and incidentally the problem of an economical substitute for sunshine with a high actinic value has been studied very carefully.

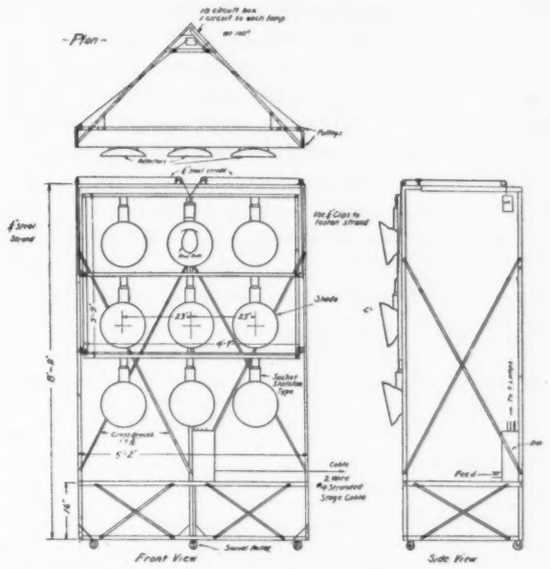


FIG. 1—FLOOR FRAME DESIGNED FOR MOTION-PICTURE LIGHTING SYSTEM

The Keystone Film Company of Los Angeles recently found it necessary to complete a large order irrespective of weather conditions, and within a period of six weeks there was built at its plant a concrete building 100 by 150 ft. (30.48 m. by 45.72 m.) in plan and 25 ft. (7.62 m.) high, designed to be lighted by a system the rating of which will be 2000 kw. For immediate needs, and because of the urgency behind the construction, only 750 kw. of the total lighting equipment was installed, but this was arranged so that it adequately supplied one-quarter of the entire floor space, and the remaining area can be equipped by simply adding similar circuits as an independent system supplied from separate banks of transformers.

Theoretically the present lighting equipment is sufficient to provide for only three simultaneous scenes, but practically it has been found that the lamps actually average only one hour's use to nineteen hours of work on the part of those engaged in producing a picture, so that the diversity factor would enable the equipment now installed to take care of a large area. However, the new "indoor studio" is laid out for ten simultaneous productions, and to avoid even the possibility of occasional slight delays in waiting for lamps, provision is being made for equipment that can be left at the exclusive disposal of each director throughout preparation and rehearsal periods. The one to nineteen ratio, however, has been taken into account in selecting transformer room equipment.

Two types of lighting unit standards or frames are used. One type are mounted on rollers and moved about on the floor, while the other type are suspended from the overhead trolleys, on which they can be moved along as desired. The suspended frames are counterbalanced so they can be readily placed at any desired elevation. Structurally the two types of frames are much alike. They are made up of 1½-in. by 2½-in. (38.1 by 63.5 mm.) angle irons around the outside with 1½ by 1½ by 3/16-in. (38.1 by 38.1 by 4.76 mm.) cross-ties and 1 in. by 3/16-in. (25.4 by 4.76 mm.) boxes. The frames are bolted with ⅜-in (9.52 mm.) bolts and gusset plates are used at corners. Completely equipped suspended frames, in place, cost about $130 each and the floor frames $140 each.

Each frame carries nine 1000-watt gas-filled lamps in blue glass, which are operated at 128 volts. This includes a 10 per cent voltage increase provided by small step-up transformers. Each of these nine-lamp frames is considered a unit, and standard scene sets of various sizes call for a tabulated number of lighting units. The life of these lamps has been found to be about 800 hours, or the cost of maintenance per lamp per year is figured at approximately $1.90.

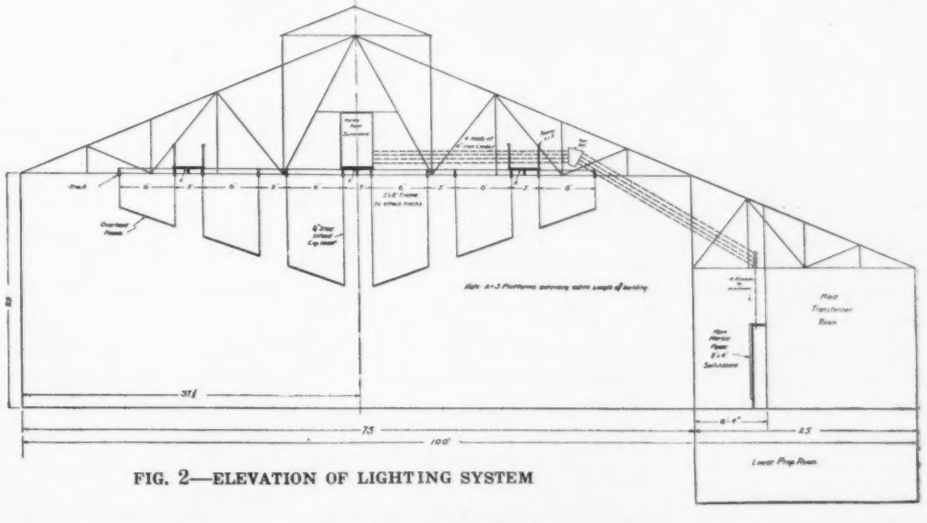


FIG. 2—ELEVATION OF LIGHTING SYSTEM

In comparing these lighting units with mercury-vapor tubes used for the same purpose, certain peculiarities have been noted. The electricians have pointed out

that sets 24 ft. by 32 ft. (7.31 m. by 9.75 m.) in size require about the same number of mercury-vapor tubes as gas-filled lamps. In smaller sets the "short throw" on the mercury-vapor tube is an advantage and a soft diffused light is secured with comparatively fewer units. On larger sets, however, the gas-filled units are the more effective and give photographic conditions up to three or four times the range of the others. The gas-filled lamps have a further advantage in permitting the circuit to be cut in at full efficiency instantaneously.

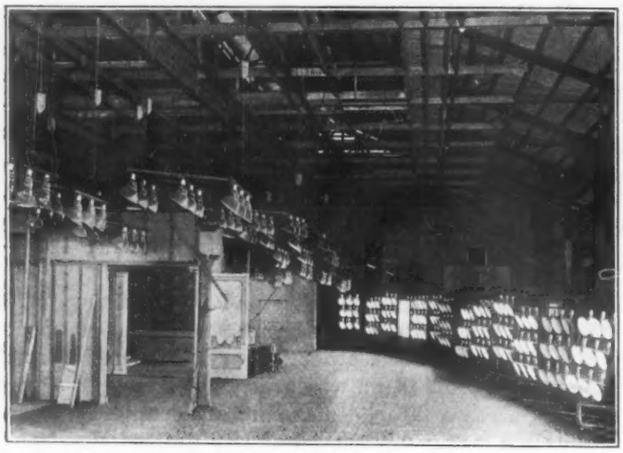


FIG. 3—AS AN ECONOMICAL SUBSTITUTE FOR SUNSHINE INCANDESCENT LAMPS WITH REFLECTORS HAVE BEEN USED VERY SUCCESSFULLY IN SOUTHERN CALIFORNIA STUDIOS

The transformer room which serves the new Keystone installation is now provided with 50-kw. transformers, and there is space for additional capacity that will be required when the system is enlarged. From the transformer room 4-in. (10.16 cm.) iron condulets carry the leads to a remote-control switchboard on the lower chord of the roof trusses. This board is designed to serve only one-quarter of the entire floor area and will be supplemented by three others in other parts of the building when the installation is completed to full capacity.

The lamps in use in the new indoor studio were supplied by the Western Electric Company and the Los Angeles Gas & Electric Company furnishes the energy. Paul Guerin is chief electrician for the Keystone Film Company.

SENSITIVE SELENIUM CELL

Crystals Produced by Sublimation Allowed to Absorb Argon, Helium or Neon

A selenium cell having a sensitiveness a thousand times greater than the ordinary is described by Fay C. Brown of Berkeley, Cal., in patent No. 1,219,432. The chief feature is in the production of the crystals by sublimation and then allowing the crystals to absorb the gas argon, helium or neon at a temperature below that of crystal formation. Both large crystals and those of microscopic size were investigated, the inventor stating that crystals produced by his method after being exposed to most intense light twenty-four hours a day for thirty-five days in succession showed absolutely no deterioration. In another case a selenium cell subject to ordinary conditions showed the same sensibility after a period of a year.

CENTRAL STATION EQUIPMENT COSTS

Data Based on Prices Paid by a Massachusetts Company for Making a 2500-Kw. Extension to Its Plant

Recent improvements on the system of the Fitchburg (Mass.) Gas & Electric Light Company included the installation of a 2500-kw. high-pressure Westinghouse turbine with LeBlanc condenser and foundations, centrifugal feed pump, piping, superheaters, two 500-hp. Bigelow-Hornsby water-tube boilers, two Taylor stokers, feed-water meter, air compressor, pipe covering, coal-handling equipment, economizers, mechanical draft apparatus and a 1000-hp. feed-water heater. To house the additional equipment the plant was extended about 36 ft. (10.97 m.). From the cost sheets of the company the following items are printed to give engineers a general idea of the relative unit costs of equipment in a plant of this size:

One 2500-kw. Westinghouse double-flow turbine (not including generator), with one No. 14 LeBlanc condenser, complete with pumps	$19,779.40
Turbine foundations	2,221.76
One 300-gal.-per-minute Westinghouse centrifugal boiler-feed pump	1,545.00
Connecting turbine and condenser	472.86
Galvanized-iron air duct for turbine	236.00
One type C duplex piston automatic pump and receiver	125.40
Miscellaneous items, completed December, 1914	973.43
One 5-in. (12.7 cm.) and two 6-in. (15.2 cm.) Edwards check valves	318.68
Installation of above	114.30
New superheater for 240-hp. Stirling boiler	675.00
Piping, covering and brickwork for above	228.69
Freight, teaming, insurance and miscellaneous	111.94
Two 500-hp. Bigelow-Hornsby water-tube boilers	9,000.00
Masonry in connection with above	1,316.94
Foundations	4,206.67
Two Foster superheaters	2,900.00
Two feed-water controllers	160.00
Labor, Fitchburg company's force	418.19
Pipe covering	167.95
Miscellaneous	1,073.59
Labor and material installing floor grates	57.57
(Note.—Total additions to boilers, $20,782.34)	
Two Taylor stokers, grates, fans, engine and driving mechanism	9,785.00
Foundations for above (paid contractor)	704.13
Crushed stone, sand, etc., for foundation	165.00
Steel for coal hoppers	329.41
Labor for coal hoppers	157.20
Shafting, hangers, chains, etc	301.00
One 5-in. by 5-in. (12.7-cm. by 12.7-cm.) vertical stoker engine	248.00
Labor, Fitchburg company's force	592.49
Other items	711.87
Four sheet-steel boxes for stokers in ash pit	48.00
Labor and material installing above boxes	30.33
(Note.—Total additions on account of stoker cost, $13,072.43)	
One 4-in. (10.16-cm.) type M Venturi registering and indicating feed-water meter	465.00
Freight, teaming and installation of above	46.02
Piping installation, in connection with station increase	16,028.66
Coal-handling apparatus	4,967.10
One 1000-hp. Whitlock feed-water heater	575.00
Sturtevant economizer installation for additional capacity of plant	12,423.14
One 5-hp. motor and wiring for above	73.75
One 3125-kva. 60-cycle, three-phase, 2300-volt generator	9,879.60
Other labor and material	571.92
Three sheet-steel guards for generator flywheels (old units)	60.00
One 75-kw. motor-generator exciter set, 115-hp., 2200-volt motor	1,758.00
Two 2500-volt aluminum lightning arresters	234.00
Six 300-amp., 250-volt single-pole switches	29.70

It should be said that the total cost of the complete improvements outlined is not obtainable by adding items segregated herewith, since the data presented includes merely items of broad interest.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

STANDARDIZING TRANSFORMERS

Operating Company in Middle West Adopts 100-Kw., 6600-Volt Transformers for All Rural Lines

According to experiences related at a recent convention of the Wisconsin Electrical Association, the Wisconsin-Minnesota Light & Power Company is now operating small-town distribution systems at 6600 volts, but would change to 13,200-volt operation for this service and effect a further copper saving if suitable low-priced lightning arresters for 13,200-volt service were on the market. The same company has adopted 100-kw. transformers as standard for all small-town substations, even if the immediate load seems only to justify a 50-kw. unit. This plan is followed because there are only slight differences in the prices and losses of 100-kw. and 50-kw. units. In addition there is an advantage in providing initially for a generous increase in load and in having uniform-size units.

Considerable interest was also manifested at this meeting in the question, "What is the largest single-phase motor that can be placed in small towns at the ends of long lines without giving trouble?" The feed-mill business requires a 30-hp. or 40-hp. motor, and units of this size sometimes give trouble. The practical solution advanced was to install plenty of copper and a pole-top feeder regulator. In instances where this has been done the trouble produced by 40-hp. motors has been eliminated.

It was the universal experience of the engineers present that the unaccounted-for losses (with energy sold from the producing company's switchboard) are much higher in transmission service than is considered reasonable in local distribution work. One operator on a 33,000-volt line found that 65 per cent of the energy delivered to the step-up transformers at the sending end was dissipated in losses. This figure was higher than the average, however, it being the general opinion that the unaccounted-for loss is about 50 per cent.

KEEPING PEACE IN THE GANG

The Psychological Effect of Letting Workmen Select Their Own Foreman

After experiencing considerable trouble in getting laborers to obey orders and work together without friction, the superintendent of an Eastern central station hit upon an idea. He went to each man separately and asked whom he considered the best man in the crowd. Nine out of the twelve men in one gang assured him that "Tony" was the pick of the group. "All right," said the superintendent, "Tony is the foreman of this gang. Tony is your boss from now on." Then Tony was called into the office and informed of the importance of his new post. When it was explained that his salary would be increased a dollar a week in consequence, he assumed a proper dignity at once. Similar arrangements were made for each gang.

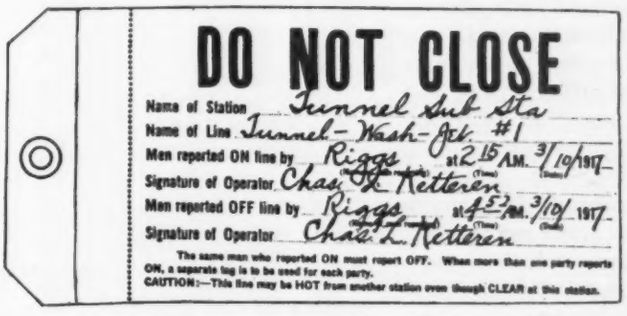
Now, when orders are to be given to a gang, the instructions are addressed directly to the foreman, who relays the message in a mixture of dialects that "gets to" all of his charges. Since the adoption of this plan the work has increased to a marked degree and there has not been a single fight—at least on the job.

HIGH-TENSION WORK

Use of Tag with Carbon Copy in Carrying Out Ten Safety Rules of Pittsburgh Operating Company

Ten safety rules governing work on high-tension lines have been put into effect on the system of the Pittsburgh Railways Company. The rules require the use of a tag like the one shown in the accompanying illustration. The tag, which is placed on the handles of high-tension oil switches, is so designed that a duplicate record is made of each tag used, a slip of paper coated with carbon on the back covering one side of each tag. When the operator fills out the blank slip the tag proper becomes the carbon copy. The paper slip is torn off and kept by the person signing it as his own record for reference in case of any future controversy. On the back of the tag are the following instructions: "Attach firmly to the switch handle so that the tag will be conspicuous and the switch cannot be closed without noticing the tag. Return the tag to the local dispatcher when report is complete."

In brief, the safety rules contain the following points: All high-tension circuits are to be considered "hot" except when cleared in accordance with these rules.


DO NOT CLOSE
Name of Station Tunnel Sub Sta
Name of Line Tunnel-Wash-Jct. #1
Men reported ON line by Riggs at 2.15 A.M. 3/10/1917
Signature of Operator Chas. L. Ketteren
Men reported OFF line by Riggs at 4.52 P.M. 3/10/1917
Signature of Operator Chas. L. Ketteren
The same man who reported ON must report OFF. When more than one party reports ON, a separate tag is to be used for each party.
CAUTION:—This line may be HOT from another station even though CLEAR at this station.

HOLD-OFF TAG WITH CARBON COPY

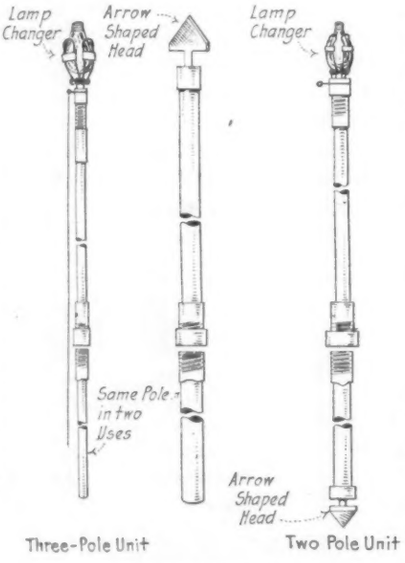
The responsibility for self-protection when working on high-tension lines rests entirely with the men doing the work and the station operators. All phases must be short-circuited and grounded at each point where work is being done. All stations on the line to be worked on must be informed of the work, and told when it is completed. Each man working on a line must report when

he goes on duty and when he quits. To clear a line, both the oil switches and the knife switches on that line must be opened and tagged in the prescribed manner. When the man signing the tag reports that the work is completed the tags are taken off the switches, the danger sign is removed and instructions are awaited from the load dispatcher. In emergency cases the operator can proceed on his own responsibility. All telephone orders have to be repeated by the person receiving them. Except in emergency, twenty-four hours' notice must be given the load dispatcher before any high-tension line can be taken off. The rules refer to circuits and equipment inside as well as outside the station.

CHANGING STREET LAMPS

Long-Handled Device for Replacing Incandescent Lamps or Removing Bases of Broken Bulbs

Each trouble wagon operated by the Electric Company of Missouri in the suburbs of St. Louis is equipped with a partly home-made lamp-changing outfit. Some of the outfits are made in three pieces and some in two pieces. The three-piece outfits consist of three 10-ft. (3-m.) poles, each of which is equipped with special devices at the ends. The upper end of pole No. 1 carries an ordinary gas-pipe coupling to which is attached a Matthews lamp changer. The other end of the pole is equipped with a similar pipe coupling. Pole No. 2 is fitted with a piece of gas pipe threaded so that it may be screwed into the coupling at the lower end of pole No. 1 to make a 20-ft. (6-m.) pole. This part of the equipment is used in removing unbroken lamps and in inserting new bulbs. Pole No. 3 of this outfit is fitted with an arrow-shaped head held in place by a ferrule. It is used as the upper section of the 20-ft. (6-m.) pole for removing the bases of broken bulbs.



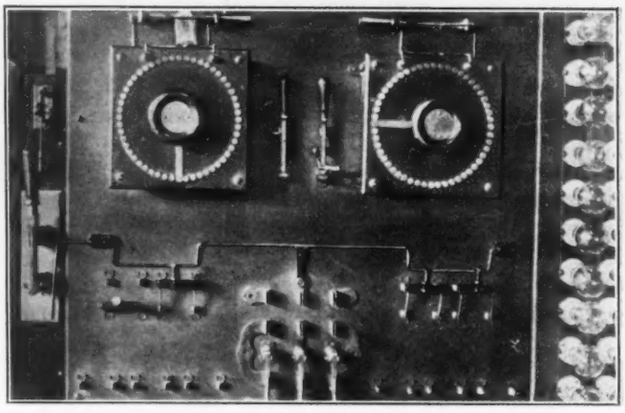
DETAILS OF THE THREE-POLE AND THE TWO-POLE UNITS

In the outfits employing only two poles, the arrow-shaped head is placed on the lower end of pole No. 2. The latter outfit can be used to perform any function of the three-pole outfit and it consists of one less piece. Furthermore, it is thought by some representatives of this company to be more convenient to use, since in replacing broken lamps it is only necessary to turn the pole end for end, while with the three-pole outfit the upper section must be changed between operations. The two-pole outfit is open to the possible objections that the cord controlling the clamping action of the lamp changer may become tangled when the pole is reversed, and that the point, being always on the lower end of the pole when the changer is in use, might constitute a hazard to workmen. Both types of outfits were made by the operating force of the Electric Company of Missouri.

MECHANISM FOR OPENING SWITCHES SIMULTANEOUSLY

Bent Rod Hinged at Each End, Passing Back of Handles to Knife Switches, Is Used in Opening the Latter

In the meter laboratory of the Cumberland County Power & Light Company of Portland, Me., means have been provided for opening all of the meter-testing switches simultaneously. As shown in the accompanying illustration, a ¼-in. (6.4-mm.) rod bent in the shape



PANEL EQUIPPED WITH BENT ROD FOR OPENING SWITCHES

of a crank shaft extends across the testing panel back of the knife-switch handles and is supported in bearings at each end. One end of the rod—that nearest the meter-testing board—is bent to form a handle so the rod can be turned by the test man without his leaving the board. When the rod is turned the offset portions strike the switch handles, thereby opening the switches. This mechanism is a decided convenience during routine work.

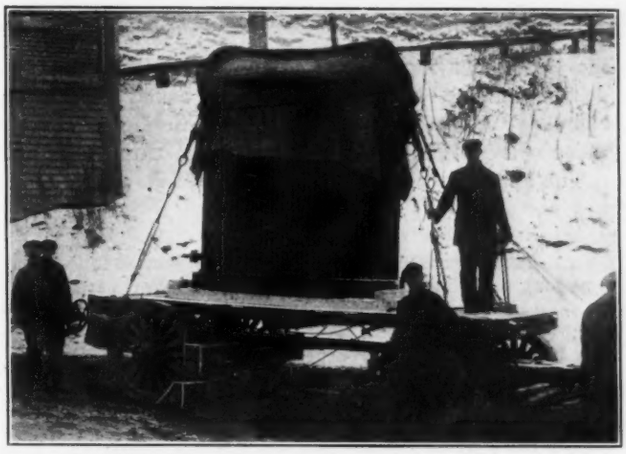
A BRAKE FOR TRUCK CARRYING TRANSFORMER

Blocks Are Arranged to Grip Rear Wheels of Vehicle When It Is Used to Move Heavy Transformers Down Inclines

To facilitate transporting a heavy transformer down an incline the construction department of the Rochester (N. Y.) Railway & Light Company developed the truck brake shown in the accompanying illustration. As will be seen, two heavy blocks are supported from the truck frame, one in front and the other in back of the rear wheels. These blocks may be made to grip the wheels like a vice by turning the hand wheels at the rear of the truck. The hand wheels are attached to rods which pass through and join the front and rear blocks, nuts being threaded on the ends of the rods where they protrude through the front block.

With this brake a load of ten tons (9.07 metric tons) may be safely conducted down a steep incline, but with heavier loads the following additional precautions are taken to avoid losing control of the truck.

On the ground in front of the rear wheels is placed a block the ends of which are shaped to the rims of the wheels. As the block drags on the ground there is a tendency for the rear wheels to ride over it, thus retarding the movement of the truck. Sometimes it is necessary to put a team of horses in back of the wagon and hitch it to the block which drags on the



TRANSPORTING A 11-TON (9.98-M. TON) TRANSFORMER DOWN HILL

ground, to obtain a secure holdback. In transporting loads weighing 20 tons to 25 tons (18.14 metric tons to 22.68 metric tons) it is necessary to employ two teams, and if loads ranging from 25 tons to 50 tons (22.68 metric tons to 45.35 metric tons) are hauled, a hoisting engine is usually attached.

HIGHER BOILER PRESSURES AND TEMPERATURES

Further Advances Depend Upon the Production of Commercial Metal with Higher Elastic-Limit Retention

The trend of station practice toward high pressures and temperatures was reviewed by Irving E. Moultrop, assistant superintendent of construction, Edison Illuminating Company of Boston, at the power plant symposium held in Boston recently. Further advances above temperatures of from 600 deg. to 700 deg. Fahr. (315 deg. C. to 372 deg. C.), it was said, depend materially upon the production of commercial metal which will have a higher elastic-limit retention than existing alloys. From the point of view of theoretical economy the incentive to use higher pressures is very great. Theoretically, the use of 300 lb. per square inch (21 kg. per sq. cm.) means a gain of 4.9 per cent in economy compared with 200 lb. per sq. in. (14 kg. per sq. cm.), keeping the temperature at 600 deg. Fahr. (315 deg. C.) and the vacuum at 29 in. (736 mm.). The use of 400 lb. per square inch (28 kg. per sq. cm.) under these conditions yields a theoretical gain of 9.7 per cent; 500 lb. per square inch (35 kg. per sq. cm.), 11.5 per cent; 600 lb. per square inch (42 kg. per sq. cm.), 13.4 per cent, and a maximum of 1574 lb. per square inch (111 kg. per sq. cm.), 22.6 per cent. At the present time boiler manufacturers are disinclined to undertake the special designs required by the use of steam pressure above 300 lb. to 350 lb. per square inch (21 kg. to 25 kg. per sq. cm.).

HOME-MADE APPARATUS FOR USE IN TESTING OIL

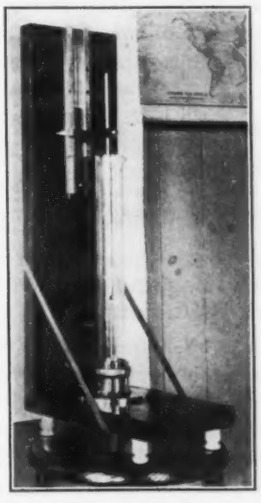
Quickly Adjustable Spark-Gap and Easily Cleaned Oil Receptacle Made This Stand a Useful Adjunct

Shown herewith is an oil-testing stand developed by L. G. Scott, head of the underground distribution department of the Cumberland County Power & Light Company, Portland, Me.

The apparatus has been used in testing with pressures up to a maximum of 35,000 volts. With it the performance of the oil can be watched with ease as the test voltage is raised or lowered. No micrometer is required in making the spark-gap adjustment. The apparatus can be cleaned far more thoroughly than the box form of oil-testing equipment or many of the tubes on the market for this work. The cost of making up this apparatus did not exceed $25.

The stand consists of two pieces of kiln-dried birch 1¼ in. (3.2 cm.) thick, treated with insulating varnish, the slabs being 8 in. (20.3 cm.) wide, 13½ in. (34.3 cm.) long and 28 in. (71.1 cm.) high, with two diagonal braces of ½-in. by ⅛-in. (12.7-mm. by 3.2-mm.) brass as shown. The bottom of the stand is supported on four porcelain insulators. Two binding posts at the rear connect with the spark-gap terminals, which extend inside a hydrometer jar 1¾ in. (4.4 cm.) in diameter. In constructing the stand the lower end of the jar was cut off and cemented into a brass collar which screws into a base flange. The latter is 5 in. (12.7 cm.) in diameter at the bottom and contains a recess ⅝ in. (15.9 mm.) deep and 2¼ in. (5.7 cm.) in diameter in which is mounted the lower electrode. This terminal is separated from the collar by a 3/16-in. (4.8-mm.) leather washer which serves the purpose of making a leak-proof joint.

The electrodes are ¼-in. (6.4-mm.) brass rods, the upper one being 16 in. (40.6 cm.) long and the lower one 6 in. (15.2 cm.). The usual hemispherical and cylindrical terminals are provided. The base flange is electrically connected with the lower binding post lead through contact with a semi-circular brass ring ¼ in. (6.4 mm.) high and ⅛ in. (3.2 mm.) wide, fastened by short pins to the lower wooden base. The upper electrode may be adjusted for height at two points, one where the rod passes through the support, which is carried by a plate sliding between guides on the upright board, and the other at the sliding plate itself. A vertical motion of 10 in. (25.4 cm.) is provided at the plate. In using the apparatus the jar and its collar are screwed into place on the lower part of the stand; the air-gap is then set to 0.2 in. (5.1 mm.) by the use of a gage and by adjusting the upper rod at its attachment to the supporting piece. The upper electrode can then be raised at the plate support and the jar filled or emptied. The correct gap can be obtained again by running the plate down the guides to a stop at the bottom of the latter.



OIL-TESTING SET

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

MECHANICAL REFRIGERATION GIVES A TIMELY LOAD

Cost of Electric Energy for Operating a 5-Ton Plant for a Butcher Shop at Special Refrigeration Rates

With spring here and summer close behind, refrigeration is a very seasonable topic. Mechanical refrigeration offers opportunities as a central station load in many different ways, from the small plant of the householder to the large plants of hotels, and including cold-storage plants for provisions and furs and for butcher shops and other stores.

COST OF OPERATING 10-HP. MOTOR FOR BUTCHER SHOP REFRIGERATION

Month	Kw-hr.	Cost	Month	Kw-hr.	Cost
January	266	$10.64	August	984	$29.52
February	278	11.12	September	922	27.66
March	294	11.76	October	656	26.04
April	354	14.16	November	490	19.60
May	388	11.64	December	338	13.52
June	514	15.42			
July	616	18.48	Totals	6100	$209.56
Average rate	3.43 cents				

In this connection an interesting rate is offered to butchers by the Public Service Electric Company, which charges them 4 cents per kilowatt-hour for the consumption in each month from October to April inclusive, and 3 cents per kilowatt-hour for the consumption in each of the five remaining months.

In a recent issue of the company's bulletin H. W. Smith, industrial power representative, gives the accompanying figures, showing the cost of operating for twelve months a 10-hp. motor driving a 5-ton refrigerating plant in a butcher shop.

AN APPEAL TO EXISTING CUSTOMERS FOR NEW ONES

Owing to Higher Operating Costs This Call for Co-operation, Made by New England Company, Has Met Marked Success

For a company to make a frank and honest appeal to its patrons to bring in more customers has been done before, but so far as records show always with some direct compensation of one form or another for helpful co-operation. When a company, however, relies on the good will of its customers to help it out of difficulties by themselves adding to their number and makes a success of the plan, it almost seems as if the central station Utopia had been found.

That is essentially what happened this spring in Pittsfield, Mass. H. W. Derry, contract agent for the Pittsfield Electric Company, addressed to every customer a printed circular entitled "Co-operation" in which was explained the increased cost of doing business and the necessity therefore of either increasing rates or greatly increasing the number of customers. Not wishing to do the former, the customers were asked to help the company in the latter way by furnishing names of those who might be interested in something electrical.

The appeal to the customers was as follows:

CO-OPERATION

A public service utility can operate successfully just so long as it has the good will of the people it serves.

We believe that we are particularly fortunate in having your good will.

While almost every other commodity has increased greatly in price, the cost of our service to you has remained the same, in spite of the facts that the cost of the coal we use to produce power has nearly doubled, that the cost of copper to transmit the power has increased four times, and that the cost of labor in all departments has also climbed upward.

In order to make both ends meet, we must increase the price or greatly increase the volume of business. We do not want to increase our prices, so we are making every effort to increase the amount of business.

Working on this line, we have recently succeeded in obtaining the power supply for three large mills, thereby increasing our power business 40 per cent.

We need more lighting business. Won't you help in the struggle to hold our prices down?

You will realize that every new customer and every electric appliance that goes onto our line helps to reduce the cost of your electrical service.

Think of some one who would be interested in something electrical, put the name on the inclosed post card and return it to us—sign your name if you wish—and by so doing co-operate with us to make our service to you more satisfactory.

With the appeal went a post card, reproduced herewith, for the customers' use in co-operating with the company.

Mr. .....

Address .....

Is interested in having his house wired .....

House is wired—wants service .....

Would like to try an Electric

Flatiron	Washing Machine .....
Toaster	Dish Washer .....
Percolator	Floor Polisher .....
Vacuum Cleaner	Sewing Machine .....
Curling Iron	Vibrator .....
Hair Dryer	Chafing Dish .....
Range	Fan .....
Air Heater	Water Heater .....
Heating Pad	Tea Samovar .....
Disk Stove	Grill .....

Name .....

Address .....

CUSTOMERS HAVE BEEN ASKED TO CO-OPERATE BY FILLING IN THE ABOVE CARD AND MAILING IT TO THE COMPANY

In describing the results of the appeal Mr. Derry informs the ELECTRICAL WORLD:

"This appeal has met with marked success, principally as it gives our customers an idea of the conditions which we are facing to-day. They have given this little letter

considerable publicity, and I have received a fair proportion of replies.

"We in Pittsfield believe that we enjoy the good will of our people to a remarkable extent, and do not hesitate to send a friendly and frank appeal to our customers."

ELECTRIC COOKING AND WATER HEATING IN WEST

Discussion of Central Station Practices with Deductions Presented Before Annual Convention of Pacific Coast Section, N. E. L. A.

Probably no other section of the United States has gone into electric cooking and all of its ramifications so deeply and so thoroughly as has the Pacific Coast. Local conditions are generally better in the Far West for electric cooking than elsewhere. For this reason the report on electric cooking and water heating by the commercial division of the Pacific Coast Section, N. E. L. A., presented at its annual convention last week, is of particular interest. The report was made by J. B. Black of the Great Western Power Company, San Francisco. Those parts of the report dealing with central station experiences and the deductions follow in full:

ADVERTISING

"There is considerable difference of opinion as to the value of advertising in introducing electric cooking and water heating. Many of the member companies have used stuffers and pamphlets, as well as newspapers and other advertising mediums, with varying and in some cases indeterminate results; but it is apparently unanimous that advertising, while of certain value as an interest awakener, is absolutely valueless unless handled as a helper to an energetic house-to-house campaign.

"Owing to the many types of electric ranges on the market the consumers' requirements are taken care of remarkably well. In fact, many of the central stations have seen fit to choose several of the more popular types and concentrate on their sale to the exclusion of the others. This method not only materially cuts down the stock investment for the central stations but also enables them to reward the progressive manufacturer and also to make the salesman's task easier by enabling him to concentrate his effort.

COST OF ELECTRIC RANGES

"The rapidly increasing price of electric equipment, of course, multiplies the difficulties of the range salesman, and it is particularly important to the company just commencing sales activity in the range line to have the first cost of the electric installation as near as possible to that of gas or coal equipment. Many of the central stations have found that it is advantageous to sell the range 'installed,' and it has been the general practice to turn over the range and make the installation at actual cost to the company. In some cases the company has even seen its way clear to make the installation at less than cost.

"The general tendency, however, seems to be gradually to raise the price of the range equipment to the standard list price at which the dealer operates. This may indicate possibly that the time is approaching when the central stations will be able to turn the merchandising of electrical ranges and water heaters over to the dealer, but certainly the time is not yet ripe, and the central stations will have to look forward to several years more of expensive development work before they can with safety withdraw entirely from the merchandising field.

WATER HEATING

"The question of heating water electrically, and particularly in connection with electric range installations, is still characterized by a wide divergence of opinion among central station men. There is, however, a decided trend in the direction of placing the water-heating business, properly handled, on a par with the electric cooking business. From the standpoint of value to the central station a combination of the two is considered ideal, and in fact opinions have been expressed that the water-heating business alone (always assuming that it is properly handled) is even more valuable to the central station than the cooking business alone when considered from a standpoint of the sales effort needed, annual income per kilowatt and the resultant load characteristics.

"The vital problem lies, of course, in keeping the water-heating load off the range peaks. Two different methods of obtaining this result have been developed: First, placing the heater on a double-throw switch with the range, and, second, employing the use of a thermally controlled 'step-type' heater operating directly on the line. This latter type of heater is finding greater favor recently, and it is particularly suited for working in parallel with a solar heater or the ordinary water-back installed in a furnace or fireplace.

"The two most important faults of the ordinary immersion or circulation type heater when installed on a double-throw switch with the range are overheating or underheating due to abnormal or subnormal use of the range equipment by the housewife. These faults are completely overcome by the thermally controlled heater, and provided the load characteristics are such that the large water-heating demands will not coincide with the demands of the range, the thermally controlled heater will approach nearer to the ideal automatic electric kitchen, toward which we are striving, though due consideration must be given to the larger radiation losses when this type is used.

INDIVIDUAL COMPANIES MUST MAKE OWN DECISION REGARDING FLAT OR METERED RATES

"The question as to the use of the flat or meter water-heating rate is still an open one, and must be settled by each company in a way that will best fit its operating conditions.

"When the water heater is placed on a meter rate, it is very important to the consumer and ultimately to the central stations that every possible method of economizing in the use of electric energy be used.

"The investigation and application of electric water heating has lagged behind that of electric cooking.

"The relation of storage capacity to the rate of use of water in the various classes of service to which electric water heating may be successfully applied, and also the relation of storage to the kilowatt rating, are of great importance, and probably more real advance in the solution of these problems has been noted than in any other phase of electric water-heating progress.

"The installation of spring faucets, lagging, and a

complete survey of both the plumbing installation and the habits of the various classes of domestic and commercial consumers, must be made and allowed for in order to insure satisfactory service. This survey is particularly essential when the installation of a thermally controlled heater on a meter basis is contemplated, as a very thorough study must be made in order to insure the resultant load characteristics which will enable the central station to grant the service the low rate which is necessary in order to make electric water heating universally practicable to the consumer and at the same time profitable to the central station.

IMPORTANCE OF BOILER INSULATION BEING OVERLOOKED

"It is the opinion of the committee that we are all more or less overlooking the importance of insulation in our study of the water-heating subject. Plant tests indicate that while the manufacturers are giving us a number of very reliable heaters, we have very few convenient and economical methods of insulating boilers and piping. We believe that from now on more attention should be given to this phase of the subject. If more of the losses can be eliminated it will go a long way toward solving the problem."

ADEQUATE INCENTIVE TO SALESMEN IS NECESSARY

Salary Plus Commission Form of Payment Held to Be Most Satisfactory, with Ratio of One Salesman to 6000 of Population

The almost phenomenal results obtained by the sales department of one operating syndicate are largely attributed to its policy of fixing the commission on various appliances so as to enable its salesmen to obtain an income far above anything heretofore considered sufficient for the service rendered.

It is certain that in order to obtain good men the opportunity to earn a good salary must be as great as, if not greater than, in other lines of merchandising. It is also certain that a substantial return to the man selling the appliances is conducive to that encouragement and enthusiasm so necessary to success. There is a difference of opinion regarding the method of paying salesmen, whether straight salary, straight commission or a combination of salary and commission.

Probably the most satisfactory method of payment, it was stated by David R. Thomas, manager Michigan Power Company, in a paper before the Michigan Section of the N. E. L. A., is that of salary plus commission—the salary to cover the service rendered the company in the way of maintaining appliances already sold, the commission to apply on the sale of new appliances. The commission should be paid monthly on all sales that have been approved by the sales manager.

DISTRIBUTION OF SALESMEN

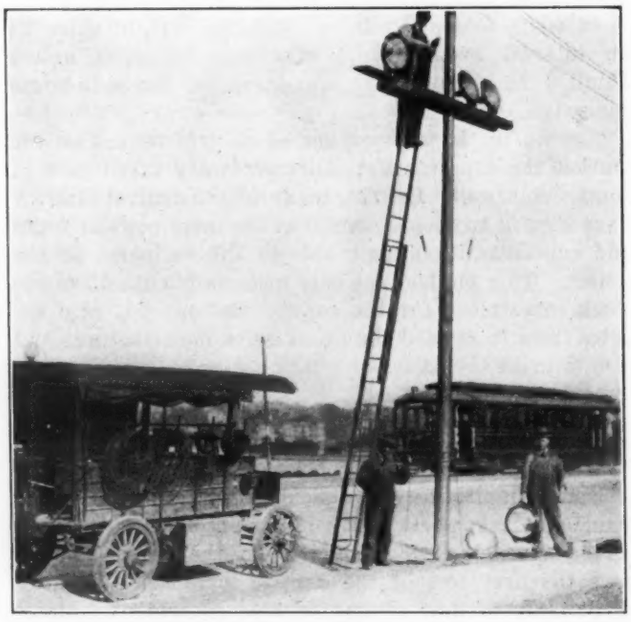
The number of salesmen required for a given population has been found, Mr. Thomas said, to vary over a wide range. In one city there was found one salesman to every 25,000 people, in another one to every 6000. In the first instance the appliance sales ran $3,000 per month for five salesmen; in the second the sales ran $20,000 per month for thirty-two salesmen. The sales per man, however, ran about the same, namely, $600 per month. In the first instance washing machines and vacuum cleaners were handled by the manufacturers, while in the second instance the central station handled all appliances.

The ratio of one salesman to 6000 of population seems to Mr. Thomas to be nearer the proper one, as it permits of what might be termed "intensive cultivation." It is essential that to each man there should be an allotted territory which it should be his duty to cover periodically. In some instances Mr. Thomas thought it might be advisable to have each salesman's territory composed of part residence, part commercial or business houses and part factories, while in other instances it might be better to classify salesmen on the basis of residence, commercial and power. Irrespective of varying local conditions, the main requirement, it was pointed out, is that each customer be called upon periodically—once a month if possible, certainly once in two months.

TEMPORARY INSTALLATION FOR FLOOD-LIGHTING

Projectors Mounted on Cross-Arms Erected for the Purpose on Trolley-Line Poles Give Complete Satisfaction

In flood-lighting the municipal auditorium of Oakland, Cal., to advertise the "ad masque" given by the advertising bureau of the Oakland Chamber of Commerce it was found that there was no available source of



MOUNTING THE PROJECTORS ON TEMPORARY CROSS-ARMS ON TROLLEY-LINE POLE

energy supply at the points where projectors should have been placed. A way out, however, was found by the San Francisco & Oakland Terminal Railways, which installed a double cross-arm, as shown in the accompanying illustration, on five trolley-line poles parallel with the auditorium. The projectors were mounted in the cross-arms, receiving energy from the wires above. In all thirty projectors were used, with excellent effect. The distance of the projectors from the building was about 500 ft. (152.4 m.).

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

TEMPERATURE RISE OF TRANSFORMER WINDINGS

Measurement by Resistance Method—Error Due to Cooling of Windings After Shutdown—Compensation for Error

IT IS standard practice to-day to rate electrical apparatus at its maximum continuous capacity. When the rating is limited by temperature (as is the case with most transformers) the insulation or some part of it is operating close to the danger point. For this reason it is more important to know accurately the average temperature of the windings than it has been in the past, when it was the practice to make the temperature guarantee for two different loads—namely, full load followed by a short-time overload. While there are three general methods of determining temperature of electrical apparatus—the thermometer method, the resistance method and the embedded temperature detector method—the A. I. E. E. rules specify that the temperature of the windings of transformers is always to be ascertained by the resistance method, although it should be supplemented by careful thermometer measurements.

In observing the temperature of transformers by means of change in resistance there usually is a sufficient lapse of time to permit an appreciable drop in temperature. In practice this drop ranges from a fraction of a degree to several degrees per minute, hence it becomes highly important to know the extent of it. The problems involved in this matter are subjected to a very careful and complete analysis in a paper by V. M. Montsinger in the A. I. E. E. *Proceedings*, April, 1917.

There are three general methods of determining the temperature at shutdown. These are as follows:

(1) To take a cooling curve and extrapolate back to the instant of shutdown. Practice has shown that generally this method is fairly reliable. In some cases, however, it is liable to error, owing to the difficulty of being able to extrapolate back correctly. This is true when considerable time is required in obtaining the initial readings or when these first readings are influenced by inductance in the windings. At any rate, commercially, this method is not always practicable, because of the increased time required.

(2) To use an arbitrary correction. The advantages of this method are simplicity and ease of application. The disadvantage is that it is liable to error. Generally speaking, for maximum rated water-cooled transformers the copper loss will vary from about 6 to 25 watts per pound. If an arbitrary correction of, say, 2 deg. C. per minute is adopted, errors of 4 or 4.5 deg. are introduced for a lapse of two to four minutes after shutdown respectively. In cases where machines operate on short-time overloads or on duty-cycle operation the error would naturally be greater than the above. Again, this method might put a premium on using high current densities.

Provided that the time does not exceed four minutes after the instant of shutdown, the following, however, seems to be about the general average rate of cooling for:

	Deg. C. per Minute
(a) Air blast transformers (air shut off)	0.5
(b) Distributing transformers (100 kva. and less)	0.5
(c) Self-cooled transformers, except (b)	1.5
(d) Water-cooled transformers	2.0

(3) To calculate the rate of cooling. The usual theoretical formula for calculating the cooling of a body is not in a convenient form for practical use. Furthermore, the conditions in a transformer are generally such that it would be difficult to apply. However, it is shown in the paper that the cooling of oil-immersed transformer windings for a limited time (four or five minutes) after shutdown is approximately a function of the watts per pound of copper, and that when it is necessary to make calculations more accurate results can be obtained by this partly empirical method than by attempting to use the theoretical formula. The author's method depends on the use of the formula

$$\theta = 1.95 W_c^{0.7} (1 - \epsilon^{-0.106 W_c^{0.81}})$$

in which

θ = cooling in deg. cent.

W_c = watts per pound of bare copper.

The advantage of this method is that it is fairly reliable and simple in application. In order to apply the formula, it is necessary only to know the watts (RI^2 + eddy-current loss) per pound of copper. The disadvantage is that in order to apply the method the current density and eddy-current loss must be known, which cannot be determined by test.

Generators, Motors and Transformers

Pressure Harmonics in Polyphase Systems and Windings.—B. HAGUE.—The first part of a mathematical article in which the properties of pressure harmonics in a polyphase system are first discussed by the use of the well-known theory, after which the effect of the distribution of the armature winding of the alternator (from which the system is derived) on the magnitude of the harmonics is considered. Tables of distribution factors are given for single-layer windings and for double-layer lap windings, forming an extension to similar tables published by S. P. Smith and R. S. H. Boulding. In the present installment the introduction is given and polyphase systems and windings (both symmetrical and hemi-symmetrical) are discussed. The equations of the power are given for both systems. The article is to be continued.—London *Electrician*, March 16, 1917.

Sudden Short-Circuiting of Three-Phase Generators.—J. BIERMANNS.—The physical processes that appear

on sudden short-circuiting of a three-phase alternator are explained, and then the differential equations are written down and solved for the case of a Y-connected generator short-circuited across one pair of its terminals and leaving one phase open-circuited. This enables the wave shapes of the stator and rotor currents and of the voltage of the open-circuited phase to be determined. These curves are drawn for generators with varying amounts of leakage. Good agreement has been observed between the theoretical curves and oscillograms taken under operating conditions. Similar investigations are extended to the case of a simultaneous short circuit of all three phases. In this case the oscillograms are the same at whatever instant the short circuit takes place, and the current rushes can reach values 15 per cent greater than in the previous case. The destructive effects of short circuits can be moderated by increasing the leakage reactance of the machines, and the most effective method of doing this is by the insertion of protective choking coils in series with the windings.—Abstracted from *Elek. Zeit.*, Oct. 26, 1916, and Nov. 2, in *Science Abstracts*, Feb. 26, 1917.

Lamps and Lighting

Mine Lamps.—F. T. Forster.—An illustrated description of two new types of portable electric mine lamps equipped with porcelain reflectors and ironclad Exide batteries. In one type the metal container for the battery has a steel case and a cast-aluminum cover; the other type has a cast-aluminum case and cover. Charging the battery and various details of design are discussed.—*Gen. Elec. Review*, April, 1917.

Generation, Transmission and Distribution

Irish Water Powers.—An editorial note on an opinion recently expressed by Lord Northcliffe that the Irish problem is an economic one and that the solution will be found in the development of the water powers available in Ireland. While at certain seasons there is a great deal of energy running to waste, the minimum flow of the Irish rivers is only about one-sixth of the ordinary maximum, and for industrial purposes, unless the hydraulic plant is supplemented (at great additional cost) with steam-driven or gas-driven plant, it is the minimum flow that fixes the capacity of the undertaking. There are certain sites at which power could be obtained close to the sea, and therefore under highly favorable conditions; and on the Shannon, which Lord Northcliffe describes as the greatest river of the British Isles, water carriage to the sea is available. At other places transmission lines would be necessary to carry the power to suitable sites for factories. A valuable feature is the fact that in many cases the rivers are fed from large lakes which could be utilized for the storage of water, greatly improving the possibilities. On the other hand, there are vested interests to be dealt with, such as navigation and fishing rights, compensation for the disturbance of which would involve heavy outlay; moreover, in many cases the hydraulic work would be very costly.—London *Elec. Review*, March 23, 1917.

Regulating Water Powers.—Paul Levy Salvador.—A long discussion of the importance of the problem of regulating the flow of rivers utilized for power production. Storage lakes and reservoirs are discussed and details are given of a special example. Notes are added on legislation desirable in France in connection with this problem.—*Rev. Gen. d'Elec.*, Feb. 17, 1917.

Installations, Systems and Appliances

Frequency Changers.—In the discussion of R. Townend's recent paper Miles Walker emphasized that the coupling of two power stations by means of synchronous frequency changers was analogous to a solid coupling connecting two machines driven by independent prime movers. He discussed the use of induction motors, and emphasized the point that if a commutating machine were introduced into the rotor circuit of the induction motor there would be all sorts of possibili-

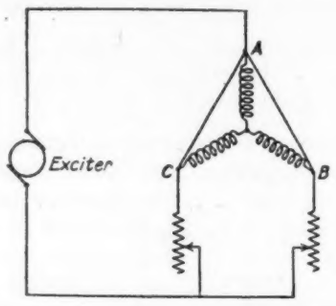


FIG. 1—CONNECTIONS OF THREE-PHASE GENERATOR TO AN EXCITER AND TWO RHEOSTATS

ties. For instance, a frequency changer from 50 to 40 cycles might consist of a twelve-pole, 50-cycle synchronous generator (in the 50-cycle supply) directly connected to a ten-pole induction motor belonging to the 40-cycle supply. The set would run at 500 r.p.m., so that the induction motor would be running at 4 per cent above synchronous speed and would tend to deliver power to the 40-cycle circuit. If now the rotor circuit of the induction motor was connected to a phase advancer whose excitation was so arranged that it boosted against the emf. generated in the rotor conductors, the asynchronous machine could be made to operate as a motor, notwithstanding the fact that it was running above synchronous speed; and at the same time, by suitable arrangement of the field coils, the power factor could be kept near unity or leading. Moreover, when the asynchronous machine was required to supply a generator load, the phase advancer could be used to supply the wattless component of the load. With respect to the comparative advantages and disadvantages of the induction type and the synchronous type of frequency changers, it would be found that the addition of a phase advancer to the induction type completely changed the situation, since all the advantages possessed by the synchronous type would now be found in the induction type, and at the same time the great objection to the rigidity of the coupling incident to the synchronous frequency changer be entirely removed. In cases where the synchronous frequency changer was employed there was another method of changing the load between sets run in parallel other than that of rocking the stator. If the field magnet of one of the synchronous machines be wound with a polyphase winding, say as a three-phase machine, it is possible to shift the position of the poles of the magnet relatively to the iron, and in this way secure the same effect as by rocking the stator. Fig. 1 shows how a three-phase generator can be connected to an exciter and two rheostats so as to obtain a shifting of the pole through an angle of 60 deg. If all the exciting current is passed through phases *A* and *B*, the resultant field will be *AB*. If the current after passing through *A* be equally divided be-

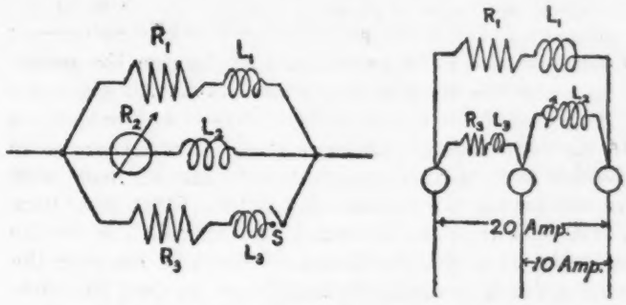
tween *B* and *C*, the line of the poles will be in phase with *A*. If all the current be passed through phases *A* and *C*, the line of the poles will take a position *AC*. It is also possible to build a special exciter which will give any required phase position of the excitation on the rotor, and in cases where perfectly synchronous running is required the exciter operates as a continuous-current generator. In his final reply the author (Townend) said that there was no doubt that the use of a phase advancer in conjunction with an induction frequency changer would give operating characteristics which are on an equality with, and in some respects better than, those of the synchronous set, but in the majority of cases the cost of the former would be higher than the latter; also attention and maintenance would be slightly greater. The arrangement shown in Fig. 1 gives a simple way of obtaining a displacement of the poles, but no doubt a standard type of machine with salient poles and a movable stator is more desirable and less expensive.—London *Electrician*, March 23, 1917.

Electrochemistry and Batteries

Electrolytic Equivalents of Gases.—CARL HERING.—An article in which the author points out that in the case of elements which are gases Faraday's law becomes much simpler if the amounts set free are stated by volume instead of by weight. The author restricts the discussion to the six gases—bromine, chlorine, fluorine, hydrogen, nitrogen and oxygen—which are diatomic at ordinary temperatures. The quantities of any of these gases set free by electrolysis at 0 deg. and 760 mm. are by volume and for a change of valence of unity equal to 0.11602 cu. cm. per coulomb, 0.41767 liter per ampere-hour, 14.750 cu. ft. per 1000 amp.-hr. The reciprocals of these standard values are 8.6193 coulombs per cu. cm., 2.3943 amp.-hr. per liter, 67.798 amp.-hr. per cubic foot. "The equivalence between the quantity of electricity and the volume of the elements when in the form of gases or vapors, instead of their weights, may be termed the electrophysical equivalent as distinguished from the more usual electrochemical equivalents, as it is independent of the atomic weights. It may be said to be the fundamental or basic law, and that Faraday's law as usually stated is a deduction from it or a corollary. It applies strictly, however, only to perfect or ideal gases; it seems that the gaseous elements do not all behave like perfect gases, but the differences are slight, being apparently of the order of fractions of a per cent, and hence can be neglected for all practical purposes."—*Metallurgical and Chemical Engineering*, April 1, 1917.

Units, Measurements and Instruments

Measurement of Large High-Frequency Currents.—G. KEINATH.—There is no difficulty in measuring high-frequency currents of 5 amp. or 10 amp. by means of ordinary hot-wire instruments with subdivided hot wires. For larger currents up to about 50 amp. instruments have been designed with systems of such wires connected in parallel. They have been found to give errors of 30 per cent on short wave lengths and to have variable zero readings. Similar instruments have been made with thin and short platinum-iridium strips connected in parallel between heavy copper blocks giving improved accuracy but still having errors of 10 per cent and changeability of the zero readings due to the considerable heating at high currents. A new instrument of the induction-dynamometer type is described, consisting of a fixed coil and a coaxial pivoted short-circuited coil. The reading of such an instrument is independent of the supply frequency if the resistance of the moving coil is small compared with its reactance. However, the full deflection would be only 90 deg., of which only about two-thirds can be used for measurements. The scale may be lengthened to 180 deg., according to a suggestion of Papalexi, by constructing both the fixed and moving systems as two coils in series,



FIGS. 2 AND 3—METHOD OF CONNECTING MULTIPLE-RANGE INSTRUMENTS

the two coils being in planes at right angles like equatorial and meridian planes. The equatorial coils maintain a magnetic coupling between the two systems even in the case when the meridian coils are at right angles. This type of instrument has a fairly evenly divided scale and is used directly for currents up to 5 amp. and with inductive shunts for higher currents. These shunts are adjusted by alteration of the pitch of the spirally wound coils of which they are composed. The objection to this instrument lies in the fact that with the 5-amp. size about 50 amp.-turns are required, which corresponds to an inductance of 7000 cm. This involves the danger of the induction of very high voltages in the windings. The author tested normal hot-wire ammeters with shunts specially designed so as to have the same time constant as the instrument with an external inductance in its circuit. This type of instrument is practically unaffected by the supply frequency, giving an accuracy of about 5 per cent on waves as short as 135 m. (443 ft.). The variation of the zero with temperature is completely compensated by an ingenious device consisting of a second wire actuating the spring keeping the hot wire in tension. The 500-amp. size has a hot wire carrying 10 amp. and a volt drop of 0.25 volt on direct current. It has no appreciable error between 1000 and 10,000 cycles per second. Multiple-range instruments are connected according to the methods shown in Figs. 2 and 3.—Abstracted from *Jahrb. d. Drahtl. Tele*, August, 1916, in *Science Abstracts*, Feb. 26, 1917.

Telegraphy, Telephony and Signals

Machine-Switching Telephone Gear.—F. R. MCBERTY.—The first part of a long illustrated abstract of a paper read before the (British) Institution of Electrical Engineers. The author reviews comprehensively the subject of automatic telephony. After some general considerations, computation of traffic is dealt with and a comparison is made between observed results and computed chances. The advantages of automatic telephony are shown, and in conclusion results are given for the maintenance of machine switches.—London *Electrician*, March 23, 1917.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

DENIAL OF INJUNCTION IN FUSE CASE TO BE APPEALED

Formal Appeal from Decision of Justice Pendleton Is Entered and Argument Set for May 4 Before Appellate Division

Roger L. Foote, general counsel for the Economy Fuse & Manufacturing Company, in an interview with a representative of the ELECTRICAL WORLD in New York, said that the company had appealed the order entered by Justice Pendleton on April 14 denying the motion for a preliminary injunction against the electrical committee of the National Fire Protection Association, and that the appeal would come up for argument on May 4 in the Appellate Division of the Supreme Court.

Mr. Foote stated further that the case of the company would be pushed to a hearing as vigorously as possible as soon as the Appellate Division of the Supreme Court had decided the motion.

GREATER NEW YORK JOBBERS ORGANIZE ELECTRICAL CLUB

Forty Concerns Join in Organization to Consider Problems in Metropolitan District and Ways of Bettering Conditions

A meeting of various concerns in the electrical jobbing business in Greater New York was held at Mouquin's restaurant on the evening of April 17. The problems of the electrical jobbing business in Greater New York territory and ways of bettering conditions were discussed. The meeting was enthusiastic and was attended by fifty-one representatives of forty-two electrical jobbing concerns.

It was decided unanimously to form the Electrical Club of Greater New York. The following concerns have been enrolled as charter members of the new organization:

Manhattan Electrical Supply Company, E. Whitmore.
Weber Supply Company, Fred W. Weber and William Smart.
P. H. Addison, Mr. Sternberg.
E. B. Latham & Co., E. B. Latham.
David Killoch Company, David Killoch.
Madison Electrical Supply Company, M. R. Greason.
W. R. Ostrander & Co., C. P. LaShelle.
Royal-Eastern Electrical Supply Company, Charles P. Scott and J. D. Sweeney.
A. Shemel & Co., A. Shemel and Meyer Zuckr.
Stanley & Patterson, George L. Patterson, Arthur F. Stanley and George H. Hopper.
J. A. Pizzini.
J. H. Bunnell & Co., Mr. Johnson.
Eclipse Light Company, Mr. Rothenstein.
Burnet Company, W. S. Jones.
J. J. Leahy.
Alpha Electric Company, Inc., A. T. Thacher, J. H. Hughes and Walter Williamson.
Baily Electrical Supply Company, Louis D. Baily.
Bronx Electrical Supply Company, William J. Courtney.
Brooklyn Electrical Supply Company, H. T. Hochhausen.
Crannell, Nugent & Kranzer, Inc., W. J. Kranzer.
H. Cohn.
Central Electrical Supply Company, George M. Beatty.
Charles F. Campbell.
Samuel Frost.
Fullerton Electric Company, Fred W. L. Fullerton.
Fletcher Electric Company, P. M. Fletcher.
G & G Electric Company, G. Soffer.
Greeley Electric Company, W. John Killoch.
Hartt & Morison, Charles T. Morison and James J. Hartt.
H. Heller.
H. Hirschfeld Electrical Supply Company, M. Hirschfeld.
Holloway, Bentz & Co., Charles Bentz and John T. Koehler.
Independent Electrical Supply Company, H. H. Habst.
Metropolitan Electrical Supply Company, Leon Portnow.
Northwestern Electric Equipment Company, J. E. McClernon and W. Jockers.
Charles G. Robin, Inc., Charles G. Robin.
Starobin Electrical Supply Company, Joseph Starobin.
Sibley-Pitman Electric Corporation, H. Q. Foreman and F. S. Gardner.
Silk City Electric Supply Company, I. I. Jaffe.
Tri-City Electric Company, Joseph R. Spurr.
Walsh Electrical Supply Company, John F. Walsh.

Charles P. Scott of the Royal-Eastern Electrical Supply Company was elected chairman and W. J. Kranzer of Crannell, Nugent & Kranzer secretary.

The following executive committee was elected: J. E. McClernon, Northwestern Electric Equipment Company; Charles B. Bentz, Holloway, Bentz & Company; James J. Hartt, Hartt & Morison; C. P. La Shelle, W. R. Ostrander & Company; H. H. Kabat, Independent Electrical Supply Company.

Meetings will be held each Tuesday evening for the first month until the organization can be perfected, after which they will be held bimonthly, and later monthly.

OUTLET BOX SECTION MEETING OF ASSOCIATED MANUFACTURERS

F. W. Hall Elected Chairman for Coming Year—Standard Packages and Methods of Packing, Shipping, Etc., Under Consideration

The outlet box section of the Associated Manufacturers of Electrical Supplies met at the association offices, 62 Cedar Street, New York City, on April 24. The meeting was large and enthusiastic, practically all members of the section being present. The standardization committee submitted a memorandum covering a number of important subjects for consideration, and these were taken up by the meeting and discussed at length.

New officers of the section for the coming year were elected, as follows: F. W. Hall, chairman, Sprague Electric Works, New York City; H. G. Knoderer, secretary, National Metal Molding Company, Pittsburgh, Pa.; Hobart D. Betts, treasurer, Thomas & Betts Company, New York City. New committees have not yet been named.

Among various subjects, the section has taken under consideration standard packages and methods of packing, shipping, etc., and a committee has been appointed to make a study and to report at the next meeting. This is one of the activities which have been taken up by the association lately, and committees have been appointed in a number of the sections to make an extensive study of the matter with a view to uniform standardization so far as it is possible to carry it out.

Removal of the general offices of the Associated Manufacturers to the new offices, 30 East Forty-second Street, is to take place on May 1.

ALTERED PLANS FOR THE N. E. L. A. ANNUAL CONVENTION

Leaders of the Industry Approve the Action of President Wagner in Making National Service Paramount

As forecast in last week's issue of the ELECTRICAL WORLD, the plans for the 1917 convention of the National Electric Light Association have been altered materially.

President Herbert A. Wagner has issued a letter reviewing the circumstances and reasons why, in the public interest, it has been decided to forego the usual large convention and substitute a conference at the headquarters in New York on May 9 and 10. Mr. Wagner's letter in part is as follows:

"Until the last moment it had been hoped and believed that the annual convention of the association could be held as usual, but in these days of national crisis events march swiftly, and decisions with reference to the aspect of affairs, changing from day to day, with equal promptitude have to be made. The opinion now prevails that the date for holding the convention should be advanced and that the meeting itself should be materially changed in character.

"Perhaps never before have we been confronted with conditions affecting our members which make it more desirable and necessary to get together and discuss ways and means for the conduct of our affairs within the next year.

"We are compelled by every dictate of citizenship and patriotism to do all in our power to uphold and assist the government in the prodigious task before it and to lead in encouraging patriotic service and sacrifice, while at the same time we must continue to serve the community in which we operate and to furnish power to industries upon which the government will be dependent for supplies and lighting for the protection of property and citizens.

"We must assist the government particularly in the organization on the most efficient basis of the industries of the country, that they may not be seriously interfered with by the draft of men for military service.

"It is necessary to find means through organization and government co-operation to use our highly trained men for the most useful service, which will in many cases be in continuing work which they have at present in hand. We need to consult with each other and to consider these matters, and the convention called for May should present unequaled opportunity for this.

"In order that these most important matters should have first and full consideration, it is now deemed advisable to curtail as far as possible our proposed program, leaving this to be presented merely in the formal way of receiving printed reports and papers with discussions to be presented in writing at a later date. This radical change in the program will probably result in the natural limitation of attendance largely to the direct representatives of member companies.

"Therefore, with the highest welfare and interests of the association at heart, and in view of the power invested in me as president by the executive committee to decide the time and place of the annual meeting, and after receiving the benefit of a full discussion of the matter by the public policy committee, I have issued instructions to the association staff and its committees to cease all preparations for Atlantic City and to abandon all work in connection therewith.

"The regular continuance of association functions, under the constitution, requires an annual meeting in May or June. In the confidence that the executive committee will ratify my action I call an annual convention to be held at the United Engineering Society Building, New York, on Wednesday and Thursday, May 9 and 10, of Class A and D member companies and such of their member officers and member employees as may be delegated to attend, for the discharge of regular business and the consideration of such other matters as may be deemed necessary to dispose of at that time. Admission to meetings will be limited to those presenting credentials from Class A and D members. Executive sessions will be limited as usual to delegates, one each, of Class A members.

"It is realized that this is very short notice, but we must yield to the necessities of the situation and shape our affairs with the aim of insuring the welfare of our country and the highest efficiency of the industry. To these ends I invite and request the fullest co-operation of all member companies."

A meeting of the executive committee of the N. E. L. A. was scheduled for April 27.

NATIONAL SERVICE PARAMOUNT

FROM SAMUEL INSULL

To the Electrical World:

Telegram received. My belief is that the national crisis demands that we should do everything possible to increase efficiency in our business, and any time we have to spare should be devoted to the nation and not to the convention.

SAMUEL INSULL,
President Commonwealth Edison Company.
Chicago, Ill., April 23, 1917.

FROM JOSEPH B. McCALL

To the Electrical World:

The postponement of the N. E. L. A. convention meets with my hearty approval, as it is highly important that the trained men of the public utility corporations should be "on their jobs" at this time.

JOSEPH B. McCALL,
President Philadelphia Electric Company.
Philadelphia, Pa., April 23, 1917.

FROM C. L. EDGAR

To the Electrical World:

I heartily favor the proposal of postponing the coming convention of the National Electric Light Association. I think that this association can during the coming year more than ever justify its existence by doing big things, and it can well afford to set aside for the moment the very valuable routine work which it has been doing in past years, confining its attention almost entirely to the questions arising out of the national crisis and calling an immediate meeting of the executives of its member companies.

C. L. EDGAR,
President Edison Electric Illuminating Company of Boston.
Boston, Mass., April 23, 1917.

PATRIOTIC SERVICE OF THE ENGINEERING PROFESSION

Gano Dunn, as Chairman of the Engineering Committee, National Research Council, Shows Work of National Society Members

Gano Dunn, chairman of the engineering committee, National Research Council, has written a letter describing the relations of the engineering societies to the agencies of national defense. Mr. Dunn says in part:

GREAT DEMANDS FOR POWER

FROM JACOB GOULD SCHURMAN, PRESIDENT CORNELL UNIVERSITY

To the ELECTRICAL WORLD:

The entrance of the United States into the war will require a more intensive manufacture of war materials. There will therefore be great demands for power from the central station industry, and there is some doubt as to its ability to supply more than its present output. There will also be a call for all kinds of electrical apparatus for the equipment of factories and for the extension of central stations.

During the last two years expansion in plant has not kept pace with the increase in demand for equipment, so that prices are high and deliveries are low. The electrical manufacturers already have orders on their books for months ahead, so that with the rush of work now in prospect there will be an exaggeration of the present conditions where factories are refusing orders and wages are higher than they have been for many years.

Ithaca, N. Y. JACOB GOULD SCHURMAN.

"The engineering profession, which has been so prompt to volunteer its professional and military services to the government in support of national defense, is now in contact with the various government agencies, as follows:

"First, through the Naval Consulting Board and its formerly existing committee on industrial preparedness.

"Second, in a more or less informal way, through the joint committee on Engineers' Reserve Corps and the military engineering committee of New York, the military services of engineers are being organized and offered to the government, and an engineers' regiment is recruiting in New York. The constitutions of the national engineering societies were found to contain such limitations that these societies could not take formal action in military matters. A little over a year ago the military engineering committee organized itself through the spontaneous action of a group of leading engineers.

"Third, through the National Research Council created by the National Academy of Sciences.

"To the committee on engineering of the National Research Council each of the National Engineering Socities has contributed two representatives and stands ready to contribute others as called for. With the engineers who are members of the National Research Council, these constitute the engineering committee.

"The representatives so far named from the American Society of Civil Engineers are George F. Swain, Edgar C. Marburg and Clemens Herschel; American Institute of Mining Engineers, Pope Yeatman, Albert Sauveur, Charles F. Rand and George K. Burgess; American Society of Mechanical Engineers, W. F. M. Goss, John N. Freeman, C. D. Young, William F. Durand, John A. Brashear, Hollis Godfrey, Howard E. Coffin and Ambrose Swasey; American Institute of Electrical Engineers, Frank B. Jewett, Clayton H. Sharp, Gano Dunn, C. E. Skinner, Michael I. Pupin, S. W. Stratton, Elihu Thomson and John J. Carty; American Institute of Consulting Engineers, Lewis B. Stillwell.

"In addition to supporting the government in engineering research this committee also brings to the aid of the government through the National Research Council such general engineering services as are auxiliary to research.

"The national engineering societies have a further relation to the National Research Council through the Engineering Foundation. Through the action of the engineers the whole available income from the gift of Ambrose Swasey is devoted to organization and operation expenses but not research expenses of the council.

"Fourth, through an engineering section of that committee of the Advisory Commission of the Council of National Defense which is under the direction of Dr. Hollis Godfrey, to whom the Defense Council has assigned supervision of general engineering matters, including education."

OTHER DEVELOPMENTS OF WAR

Reports received by the ELECTRICAL WORLD from many points throughout the country show that protection of plants by flood-lighting is extending rapidly.

The engineering department of the National Lamp Works has issued a valuable timely booklet on "Protective Lighting for Industrial Plants."

The National Lamp Works has allotted ground to employees for gardens at Cleveland and the General Electric Company has taken similar action at Schenectady.

The Denver Gas & Electric Light Company will plant potatoes to be sold to employees at cost.

The Louisville Gas & Electric Company will supply seeds and instructions and give prizes for employees' gardens.

The American Institute of Electrical Engineers has decided definitely to hold its annual convention, as planned before the announcement of war, at Hot Springs, Va., on June 26 to 29.

FLOOD-LIGHTING FOR INDUSTRIAL PROTECTION INCREASING IN FAVOR

At its meeting last week the Pacific Coast Section of the National Electric Light Association passed resolutions pledging service to the government.

Pacific Coast Section Has First Convention

Members of the N. E. L. A. in Far Western States Have Successful Meeting with Attendance of Over 500—Services Offered to the Government

THE first annual convention of the Pacific Coast Section of the National Electric Light Association, including the States of California, Nevada, Arizona and New Mexico, was held at Glenwood Mission Inn, Riverside, Cal., on April 19, 20 and 21. In three months this new section, which now represents fifty-one central stations, has enrolled 1419 members, making it the largest geographical section in point of numbers, although the density of population in the territory covered is less than in any other section. The registration at the convention was over 500.

R. H. Ballard, Southern California Edison Company, president of the new section, presided at the opening session on Thursday afternoon, April 19. The Mayor of Riverside welcomed the delegates, and in response John A. Britton, Pacific Gas & Electric Company, paid a warm tribute to southern California hospitality.

Address of President Ballard

Mr. Ballard, in a presidential address, called for "an unconventional convention," and outlined the advantages of close co-operation among the interests represented. It was pointed out that of Class A members small central stations outnumbered the larger companies three to one and that special attention should be given to the problems of the smaller company.

An exchange of information was much desired on rate problems, Mr. Ballard said, and an agreement on matters involving Railroad Commission action. Two considerations must be borne in mind—the securing of a fair rate of return and the protection of investment. Bearing on this is the fact that the central station turns its capital over only once in four or five years as against the four to eight turnovers per year in other lines of business.

The alarming increase in the price of fuel oil was pointed out as a new and most serious problem.

Reports were received from the secretary, the treasurer and the membership committee.

George B. Muldaur, representing the national association, conveyed a welcome to the new section from New York headquarters.

The meeting was then turned over to S. V. Walton, Pacific Gas & Electric Company, chairman of the commercial committee, and the remainder of the afternoon was devoted to commercial questions.

Simpler Rate Schedules

The paper on rate making by W. G. Vincent, Jr., Pacific Gas & Electric Company, provoked a general discussion. It was agreed that the urgent need is for simpler rates which the consumer can understand. Those who favored a straight meter rate presented views in opposition to the differential rate. The former can be explained satisfactorily to the small consumer, and the latter encourages the greatest use of electric service.

It was apparent that there are two points of view on the rate question, *i.e.*, the theory of rate making and the application of rates. The ideal way would be to have an expert study the conditions in each case and assign a rate that suited. The danger in this that makes it impracticable is the charge of discrimination. So the compromise method has been for the company to lay down the principles on which rates will be charged and then let the consumer select his own rate by the class in which he places himself.

An appeal was made to the commission to recognize the difference between classification and discrimination. Irrigation pumping installations were cited as instances of connected load that might be on the lines without using energy for several years and then in a season of drought, when the hydroelectric company least wanted it, there would come on the load curve sudden heavy demands for pumping. Some companies have as high as 70 or 80 per cent of such load. It was agreed that a fixed charge on the connected load basis was essential.

Among those who discussed the paper were H. F. Jackson, Sierra & San Francisco Power Company; L. S.

STRONG POINTS IN PRESIDENT BALLARD'S ADDRESS

In our organization particular attention has been given to the manufacturing, jobbing and contracting interests to develop a unity of effort within our area of operation, and the response in membership from these interests has been quite gratifying. Hereafter they will be represented on the executive committee. Conditions in our section of the country demand a close relation between all branches of the industry and it devolves upon us to lead the way.

This organization stands emphatically and unequivocally for closer relations and broader understanding between the utility companies and the public and will work unceasingly to that end.

A utility which through wise, skillful and diligent management has reached a point of such efficiency that it is enabled to improve its service, to operate at lower cost and to more advantageously finance its requirements should . . . receive a recognition which would tend to put a premium upon careful, economical and efficient operation.

With the modern doctrine of concentration of production and unified system of distribution serving large areas with diversified demands, the solution of the much-mooted question of municipal ownership will be worked out solely along sane and logical lines.

Costs of materials, supplies and commodities of all sorts have jumped amazingly in the past two or three years, but a review over a longer period reveals the fact that there has been a constantly increasing level of prices, aside from the abnormal development in the immediate past. . . . Yet in the face of this electric rates have been falling steadily.

Ready, California Railroad Commission; H. L. Aller, Pacific Gas & Electric Company, Phoenix, Ariz.; O. B. Coldwell, Portland Railway, Light & Power Company; A. E. Wishon, South San Joaquin Power Company; Edward Whaley, Northern California Power Company; C. F. Butte, Butte Engineering Company, San Francisco, and Frank Somers, Century Electric Company, San José.

Electric Cooking and Water Heating

The paper on electric cooking and water heating by J. B. Black brought out discussion covering a wide range of experience. Practically all of the companies whose representatives spoke had rates for water heating of 2 cents or less, 1.1 cents per kilowatt-hour being the lowest.

A plea was made by H. S. Batchelder, Western States Gas & Electric Company, for the electric heater to warm kitchens where electric ranges were in use. He had been able to show consumers how a rate of 1.5 cents per kilowatt-hour would do this as cheaply as it could be done with other fuels in rural districts.

Glenn D. Smith, Ontario Power Company, discussed his company, serving only two small towns, as typical of smaller central stations. His men had placed 140 ranges and, since no large industrial load could be expected, they looked to the electrification of the kitchen for their chief revenue. He strongly favored the electric heater for kitchen use. One dealer present had sold 150 electric heaters for use on a 7-cent basis and had had only one complaint about high bills. Of course with electric range rates in effect the cost would be correspondingly less.

Work of Engineering Committee

The first engineering session on Friday morning was presided over by J. S. Woodbridge, Sierra & San Francisco Power Company, who reviewed the work on which the engineering committee has been engaged. Co-operation with the railroad commission in deciding upon overhead construction and on inductive interference was included, as well as work on insulator failures and the standardization of various equipment.

Transformer Standards

S. J. Lisberger, Pacific Gas & Electric Company, in discussing the paper on transformer standardization, reported that the co-operation of many companies through the new section had facilitated agreement on design to which the manufacturers had responded quickly. Representatives of manufacturers and jobbers pointed out that this standardization would reduce cost, would make for quicker deliveries, and would enable the jobber to protect customers without too burdensome stock.

Mr. Jackson urged study of distributing conditions before final decision on transformer standards was adopted. Peculiarities of Western distributing systems were discussed, such as No. 4 wire lines 20 miles (32.2 km.) long serving irrigation pumps, and it was agreed that sacrifices would be made where necessary to secure some standard that all could use

Overhead-Construction Rules

An outline of the California Railroad Commission safety orders on overhead construction was presented by A. F. Bridge of the commission.

Discussion indicated the general belief that standardization of light but safe construction was preferable to much special provision for certain conditions and locations.

Others who discussed the paper were A. H. Babcock and Fred Geible, Southern Pacific Company; L. R. Brown, General Electric Company; W. P. L'Hommedieu, Westinghouse Electric & Manufacturing Company; E. R. Northmore, Los Angeles Gas & Electric Company; P. M. Downing, Pacific Gas & Electric Company, and C. O. Poole, Southern Sierras Power Company.

In discussing the paper on porcelain line insulators P. M. Lincoln, Westinghouse Electric & Manufacturing Company, announced that he had brought an expert on ceramics to the coast to study Western requirements. To find out what is the matter with insulators and how they can be improved is the undertaking of his company, he said.

Prof. R. W. Sorensen, Throop College of Technology, described an oscillator for testing line insulators. Tests on a number of Pacific Light & Power Corporation lines had shown that leaky insulators were found most often in groups. The average of defectives removed from the 150,000-volt line is about 2½ per cent per annum.

Joint Committee on Inductive Interference

Mr. Bridge announced that the joint committee on inductive interference was almost ready to report to the Railroad Commission, bringing up to date the previous orders and clearing up certain new phases of the situation. He said that effort had been made particularly toward a definition of a parallel so that power companies might know just what they were expected to avoid.

In discussing the paper on high-head Francis turbines, John A. Koontz, Great Western Power Company, cited the case of runners in the Big Bend plant on the Feather River. These runners have given satisfactory service and have not been renewed since 1908, although operating at 400 r.p.m. under a head of 420 ft. (128 m.). These wheels often operate two years without having the casings removed.

In opposition to this Mr. Poole cited the case of Francis runners under 400-ft. (121.9 m.) head on his system in which the efficiency dropped to 60 per cent in six months. After replacement the units were used another four months and were then found to have an efficiency of only 40 per cent and were removed and replaced by impulse wheels.

It was agreed that the sediment in the water limited the extent to which Francis runners could be used.

Joint Pole Construction

A discussion of joint pole construction at the engineering session on Friday afternoon, April 20, showed a belief that joint pole contracts should be drawn up by attorneys but that specifications should be left open to change.

The Los Angeles Gas & Electric Company believed that the joint pole committee had reduced its city line troubles 50 per cent. The Los Angeles joint pole committee now attends to 23,000 poles.

In discussing the question of fuse protection of transformers and branch lines there was agreement on the need of an automatic switch. The fuse was considered as now at its zenith.

One company, finding fuse trouble traceable largely to improper fusing, made up standard fuse kits which linemen are required to use. These are tin cylinders with brass tag labels.

STEAM TURBINE STANDBY STATIONS

The paper on steam turbine standby stations was followed by discussion of various methods of synchronous condenser operation. Opinion was divided on the question of whether auxiliary apparatus should be driven by steam or electricity, but it was agreed that there should always be some steam in the turbine when it is turning over at full speed.

Insulating brick boiler settings received some attention. A steam reserve pumping station in San Francisco was said to keep up steam constantly in a 250-hp. lagged boiler with only one barrel of fuel oil per day.

INDUSTRIAL ELECTRIC HEATING

The paper on industrial electric heating at the commercial session on Friday morning developed a number of suggestions for new markets. W. S. Leffler, Great Western Power Company, described an electric humidity-controlling device using 36 kw. on an 80 per cent load factor, which could be used in a wide variety of industries.

Samuel Kahn, Western States Gas & Electric Company, described crucible steel electric furnaces on his lines which, at 1 cent per kilowatt-hour, were operated at half the cost of fuel oil needed to do the same work. These had an 80 per cent power factor during regular operation.

MERCHANDISING A POPULAR SUBJECT

More discussion was brought out by the paper on merchandising than by any other paper of the commercial section.

S. M. Kennedy, Southern California Edison Company, made it clear that the central station's first duty was to its stockholders—that it must adopt that merchandising method which will develop the load desired in the most advantageous way.

Mr. Walton reported that the Pacific Gas & Electric Company had put out in a co-operative campaign last year 45,000 pieces of apparatus with a total rating of 27,000 kw.

P. H. Booth, Hotpoint Electric Heating Company, urged more activity on general publicity campaigns and intensive study of the merchandising problems of each central station.

Mr. Britton said the central station should and would help the dealer in merchandising appliances wherever the conditions were such that co-operation could be effected.

Several representatives of jobbers and dealers pointed out that co-operative plans put at the service of the central station the long experience in merchandising which dealer and jobber have acquired.

COMMERCIAL ORGANIZATION

The paper on commercial organization led to a suggestion from Mr. Aller which met very general approval. He pointed out that the small central station needs specialists just as do the larger companies, but that it cannot keep them busy. He therefore proposed that the N. E. L. A. establish a school for training such men, who could then be assigned to the companies as they were needed. The school could probably be made self-supporting or nearly so if a large central station would foster it and break in the men under the supervision of its experts.

Mr. Britton replied to this by pledging the support of his company in carrying out such a scheme.

HIGHWAY LIGHTING

The paper on highway lighting was discussed by W. D'A. Ryan, General Electric Company, and S. J. Lisberger, Pacific Gas & Electric Company.

Mr. Ryan objected to short terms on contracts for highway lighting. Highest grade equipment could be put in, he said, only on long-term contracts. He predicted rapid advance in the lighting of highways between towns and cited several recent advances in the art which promise to facilitate this.

Rural districts could not afford high intensity of highway illumination, Mr. Lisberger said. He described a plan of silhouette lighting which could be made effective at low cost.

ACCOUNTING AND PUBLIC POLICY COMMITTEES

At a final joint session on Friday afternoon the report of the accounting committee was presented by B. T. Story, chairman, Southern California Edison Company.

The public policy committee presented a resolution, which was carried unanimously, to further water-power development on equitable terms. Another resolution, carried unanimously, tendered to the government the use of the systems and service of member companies in such manner as might be desired.

NEW OFFICERS AND ENTERTAINMENTS

Officers elected for the ensuing year were as follows: President, H. F. Jackson, Sierra & San Francisco Power Company; first vice-president, Samuel Kahn, Western States Gas & Electric Company; second vice-president, E. R. Davis, Pacific Light & Power Corporation; secretary, A. H. Halloran, *Journal of Electricity;* treasurer, A. N. Kemp, Pacific Light & Power Corporation.

Additional members on the executive committee were appointed as follows: Representing manufacturers, K. E. Van Kuren, Westinghouse Electric & Manufacturing Company; representing jobbers, Dave Harris, Pacific States Electric Company; representing contractors, H. C. Reid, Pacific Fire Extinguisher Company.

Automobile trips and card tournaments were provided for the ladies while the sessions were being held.

On Thursday evening an illustrated lecture was given by C. O. Poole on the Southern Sierra's system.

At a banquet on Friday evening talks were made by Max Thelen, president California Railroad Commission; Johnathan S. Mitchell, Los Angeles Chamber of Commerce, and O. B. Coldwell, Northwest Electric Light & Power Association.

Delegates were taken by automobiles on Saturday over the "rim-of-the-world" road to the crest of the San Bernardino mountains, where a "mile-high luncheon" was served at Pine Crest by the Southern Sierras Power Company. Returning via Colton and San Bernardino, stops were made at the steam substations in these two towns and at the plant of the Riverside Portland Cement Company. The convention was closed with a ball on Saturday night.

HIGH-SPEED TELEGRAPHY APPROVED IN ENGLAND

Multiplex Apparatus Developed in American Practice Recommended by Committee in Report to Post Office Department

A report has been made by a committee appointed by the Postmaster General of Great Britain to consider the position of high-speed telegraphy.

After reviewing the automatic high-speed systems the committee announces that for ordinary commercial telegraph work between the main centers of the British post office service the inventions based on the multiplex method are superior. Multiplex systems conduce to economy in staff and in office equipment; they are subject to less serious stoppages and delays than automatic systems, necessitate less spare plant and less costly maintenance, and are economical in respect of lines and of paper tape for transmission. The report adds:

"The Western Electric multiplex apparatus is the most generally satisfactory system for busy lines which we have examined. A quadruple duplex installation of the system has been working since March last between London and Manchester. The average number of telegrams per operator per hour is consistently well over forty, and has reached forty-nine. The apparatus has dealt with about two-thirds of the whole traffic between London and Manchester on a single circuit. There are not many circuits in the kingdom capable of keeping the apparatus fully fed, but we think that the question of extending the use of the system should be proceeded with without delay."

LOS ANGELES AGREES TO BUY DISTRIBUTING SYSTEMS

Beginning May 1, Power Companies Will Be Distributing Agents of City Until Details of Purchase Are Settled

The City Council of Los Angeles has approved the revised draft of the contract covering the city's purchase of the distributing systems of the Southern California Edison and Pacific Light & Power companies. The plan carries an agreement whereby the companies will distribute power from municipal plants in conjunction with that from their own sources until the city takes over the properties.

The city will buy the desired portions of the two distributing systems for $8,270,000 plus $1,145,000 for severance damage. The temporary agreement provides that in addition to the city's power the companies will furnish such additional power as may be required by the territory served, to be, however, not less than 25,000 hp.

The companies agree to maintain the systems, make extensions and improvements, collect from consumers as the city's agents, and appoint two members of a board of supervision, two other members of which are to be appointed by the city. This board shall determine policy and decide questions governing maintenance and extension of systems and management of the business in general.

Under the temporary agreement the companies will retain from consumers' collections 8 per cent per annum on the $8,270,000 purchase price and 6 per cent on $130,000 as part of severance damage effected by the contract. The actual cost of power furnished by the companies is to be held as a trust fund, to be turned over to the city when the properties are taken. The remainder of the collections from consumers is to go to the city as its share of the business. The agreement is to go into effect subject to approval of the State Railroad Commission.

ALLIS-CHALMERS COMPANY LARGE GAIN IN BUSINESS

Sales Billed in 1916 Amount to $19,400,000, a Gain of 66 Per Cent Over 1915—$16,000,000 Unfilled Orders on March 31, 1917

Sales billed by the Allis-Chalmers Manufacturing Company during the calendar year 1916 amounted to $19,440,509, a gain of 66.6 per cent over the previous year. The profit and loss account follows:

Year ended Dec. 31—	1916	1915	1914
Sales billed	$19,440,509	$11,666,412	$10,323,150
Cost, including depreciation and development expenditures	14,699,744	9,582,264	9,221,174
Factory profit	$4,740,765	$2,084,148	$1,101,976
Selling, publicity, administrative and general expenses	1,838,454	1,353,054	1,379,685
Net manufacturing profit	$2,902,311	$731,094	*$277,709
Other income—Interest, discounts, royalties, commissions, etc.	262,709	347,258	252,641
Net profit for the year	$3,165,020	$1,078,352	*$25,068

*Loss.

Otto H. Falk, the president, says in the annual report:

"During 1916, in accordance with the policy of the company, liberal reserves were set aside out of earnings before arriving at the results above reported. The reserve for depreciation of machinery and plants amounted to $393,999 (all special machinery considered of no benefit for future operations being charged direct against contracts as part of the cost). There was also expended and charged off during the year the sum of $1,098,479 for maintenance, renewals and general upkeep of machinery and plants. Inventories were carefully reviewed prior to closing the books and items contained therein of finished and semi-finished stock considered obsolete or superseded in design were written down to estimated realizable values, and, as a further protection on account of high prices obtaining for raw materials and supplies, substantial allowances have been made in valuations.

"In order to provide for new lines of apparatus and to expand the present lines of manufacture, there was expended during the year for standard development, consisting of drawings, patterns and tools, the sum of $243,423, which has also been charged off.

"The company's cash investment in sundry marketable securities as at Dec. 31, 1916, amounted to $1,995,640.

"Following the initial preferred dividend of 3 per cent declared by the directors, payable Jan. 15, 1916, there have since been declared during 1916 dividends on preferred stock aggregating 9 per cent, of which 6 per cent were regular and 3 per cent on account of accumulated dividends. After payment of the above there remained 10 per cent in arrears on the preferred stock. The preferred stock is on a 7 per cent basis commencing with 1917.

"The unfilled orders on hand Dec. 31, 1916, made up entirely of the company's regular lines of manufacture, amounted to $13,292,178 and on March 31, 1917, they amounted to $16,000,000."

WESTERN RED CEDAR MEN IN ANNUAL MEETING

Comparative Strength Tests of Various Kinds of Poles, Including Different Makes of Steel, to Be Held in Spokane

The annual meeting of the Western Red Cedar Association was held in the Davenport Hotel, Spokane, Wash., on April 3.

In his address E. T. Chapin, Spokane, the president, said that out of the 567,000 Western red cedar poles used in 1915, 422,000 went to electric railway, light and power companies. He described the new method of creosote treatment and predicted that soon such treatment would be almost universal.

In accordance with a suggestion of President Chapin, a resolution was passed providing that a committee of three, consisting of W. M. Leavitt (chairman), E. T. Chapin and E. A. Lindsley, be authorized to arrange a series of comparative strength tests in Spokane within the next sixty to ninety days, of Western red cedar and various other kinds of poles, including the different kinds of steel; that the services of some competent engineer to outline and conduct the experiments be secured, and that a representative of the United States Forestry Department and prominent engineers from all over the country be invited.

F. C. Culver of the Sandpoint (Idaho) Lumber & Pole Company is the new president.

MONTANA POWER EARNINGS SHOW GREAT BUSINESS GROWTH

Gains of 44 Per Cent in Gross and 51 Per Cent in Net Accompany New Construction Plans to Meet Heavy Demands

Gross earnings of the Montana Power Company in 1916 increased 44.37 per cent over 1915, and net earnings increased 51.71 per cent.

In the annual report President John D. Ryan says that the gains are due to marked growth in general business, including new business from extensions to towns not previously served, and to earnings from the Chicago, Milwaukee & St. Paul Railway and sale of energy to the Anaconda Copper Mining Company's new electrolytic zinc reduction plant.

Total rated generating capacity in 1916 was 150,000 kw., as compared with 120,000 kw. in 1915; 867,940,326 kw.-hr. were generated, as compared with 488,517,672 kw.-hr. in 1915; the maximum demand was 150,000 kw., against 89,000 in 1915; at the end of the year the connected load was 275,000 kw., as compared with 200,000 kw. in 1915. During the latter part of the year the maximum demand reached the full rated plant capacity on many occasions.

In 1916 $3,400,000 was expended on new construction, transmission lines, additions and betterments.

Regarding the Holter development Mr. Ryan says: "Construction work was started in the spring of 1916 on the new 40,000-kw. development at Holter, on the Missouri River, about 30 miles (48.3 km.) north of Helena. The dam is to be 1350 ft. (411.5 m.) long and 110 ft. (33.5 m.) high and will create another large storage reservoir, which will assist materially in regulating the flow of the river for the plants lower down stream. The generating plant will consist of four vertical single-runner turbine units of 15,000-hp. capacity each. Power from this development will be delivered to the Great Falls-Morel-Anaconda transmission line, which passes over this site. It is expected that this plant will be in operation the latter part of 1917 and provide for the increased business, which will come on during the year. About $1,300,000 was expended

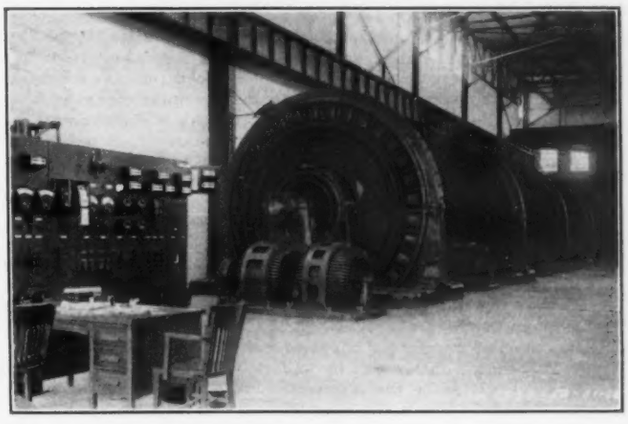
HOLTER DEVELOPMENT ON THE MISSOURI RIVER

on this construction during 1916, and it is estimated that $1,523,000 will complete this development."

Earnings of the Montana Power Company, Great Falls Power Company, Thompson Falls Power Company, Montana Reservoir & Irrigation Company and Great Falls Water Power & Town Site Company follow:

	1916	1915	1914
Gross earnings	$6,244,905	$4,359,408	$3,778,285
Operating expenses and taxes	1,491,623	1,191,904	1,139,046
Net earnings	$4,753,282	$3,167,504	$2,639,239
Interest charges	1,319,735	1,189,162	1,063,614
Surplus over charges	$3,433,547	$1,978,342	$1,575,625
Reserve for depreciation	350,000	300,000	.....
Balance to surplus	$3,083,547	$1,678,342	.....

In speaking of the substantial additions to the equipment of many mining and smelting industries, Mr. Ryan says that "the most important of these is the new electrolytic zinc plant of the Anaconda Copper Mining Company at Great Falls, requiring 30,000 kw. All of these



ANACONDA COPPER COMPANY SUBSTATION, GREAT FALLS

additions are permanent in character and provide for more economical operations, this being especially true of those applied to metallurgy and the reduction of ores, in which arts marked advances have been made in the past two years. No important decrease in earnings from these sources is anticipated upon the return of metals to normal prices."

Co-operation for Vehicle Promotion

Manufacturers Discuss Problems of Marketing and Present Concrete Proposal for Co-operation Between the Separate Interests

As a beginning to a broader co-operation between the many different interests engaged in the promotion of the electric vehicle, both commercial and passenger, representatives of vehicle, battery and accessory manufacturers gathered on Thursday of last week at the instigation of the Electric Vehicle Section of the National Electric Light Association in New York City for a general discussion of the problems involved in the successful marketing of the electric vehicle in the expectation of taking a definite step in the direction of co-operation with one another and with the central stations.

A program of four papers was arranged. The papers took up the problem of marketing the electric vehicle in all of its essential phases. "Advertising" was the title of the first paper, which was read by E. P. Chalfant, in the absence of the author, G. D. Fairgrieve, vice-president of the Anderson Electric Car Company.

Concrete Proposal for Co-operation Between Central Station Interests and Electric Vehicle, Battery and Accessory Manufacturers for Promotion and Development of the Electric Vehicle Business in Its Various Departments

WHEREAS the representatives of the central station interests at a special meeting held at the N. E. L. A. headquarters, New York, Feb. 14, 1917, were unanimous in expressing their confidence in the future of the electric vehicle business, comprising passenger cars, trucks, industrial trucks and storage batteries, the manufacturers, gathered together in this meeting, held at N. E. L. A. headquarters, New York, April 19, 1917, have unanimously agreed upon the recommendation of the following procedure to further promote the sale and use of electric vehicles:

First—Owing to the difficulty of making the central station companies in various localities familiar with the community interests of the manufacturers, due to no manufacturing company having special representatives devoting their time to this purpose, and the further fact that a representative of this grade would necessarily be a partisan, it is recommended that the combined manufacturers' and central stations' interests unite in raising a fund for the purpose of employing and defraying the expenses of an experienced and competent man, operating under the jurisdiction of the N. E. L. A. headquarters, whose duties will be to visit central stations in the cities throughout the country where electric vehicles are, or should be, in general use, for the purpose of meeting the officials of the central stations and "selling" them to a belief in the utility, efficiency and economy of electric vehicle transportation. His further mission will be to aid in the inauguration and operation of electric vehicle bureaus in central stations. It is understood that the man selected for this work will first familiarize himself with the essential details of the business from both the manufacturers' and central stations' viewpoints, and will secure the unanimous indorsement of the manufacturers of the proposals and recommendations which he will take to the central stations, in order that the manufacturers, in following up his work, shall all operate along parallel channels and talk in the same language.

It is estimated that the expense of conducting this department, including salary, traveling expenses and printed matter, will be approximately, but not to exceed, $20,000 per annum. It is recommended that the manufacturing interests that are parties to this proposition shall each contribute $1,000 per annum toward the total expenses, the balance (amounting to probably 25 per cent) to be supplied by central station interests through the N. E. L. A.

This man's duties will be under the direction of the executive committee of the Electric Vehicle Section of the N. E. L. A., and he will make reports to the officials of this section, who will in turn keep the contributing members informed of his activities.

Assuming the principles of this plan to be sound, the contributing members will be expected to commit themselves for a period of two years, it being estimated that it requires this period of time to give the plan a thorough trial.

Second—It is recommended that a booklet be prepared for distribution to central stations which shall set forth a brief history of the electric vehicle business, its potentialities and its possibilities, the same to be supported by existing statistics; also that this booklet be prepared by the joint co-operation of the advertising departments of manufacturing members and the N. E. L. A. headquarters staff. This booklet should set forth the following:

(A) Methods now being successfully employed by central stations for the local development of the electric vehicle industry, classified as to population; also composite recommendations by manufacturers for the local development of the vehicle business by central stations not already organized for that work.

(B) Plans which might be adopted by central stations in establishing electric vehicle bureaus; also recommendations as to how this work, in a preliminary way, could be handled by a man, the whole or a portion of whose time could be devoted to this development, co-operating in both sales and mechanical matters with local dealers and garage men.

(C) Specimen advertisements of a neutral nature to be used by central stations for local purposes, with or without modifications, intended for newspapers, theater programs, billboards, street cars and electrical signs.

(D) Complete information regarding charging apparatus, comprising rotary sets, mercury-arc rectifiers and rheostats and their methods of installation and use; also suggestions in regard to supplying these outfits to public and private garages on deferred payment.

(E) Information to aid central stations in co-operating with local dealers and garages for the installation of electric garages and their equipment.

(F) Information for central stations as to appliances for emergency charging at their substations, with particular reference to boosting facilities at country clubs, public parks, amusement resorts and suburban points.

(G) Recommendations to central stations for the creation of electric vehicle departments within their local organizations for the proper instructions to garage employees and to private owners for the charging and care of batteries.

(H) Information to central stations as to what has already been done in large cities regarding parking facilities and recommendations for use in cities where these facilities do not already exist.

(I) Recommendations to central stations to chart their respective localities and suburban towns, showing where the electric garaging and boosting could be obtained, and that the central stations make this information available in booklet form to owners.

(J) Cite battery exchange methods now successfully employed by central stations, with information regarding the installations, operation and co-operation available from vehicle and battery manufacturers.

(K) Recommendations to central stations, acting as neutrals, to get local garage men together for uniform methods, examples to be given of successful methods employed in different cities, showing both the flat rate and the measured service plans.

Third—Recommendation that central stations be made familiar with the value of electric vehicle charging as an off-peak, long-hour, low-demand department of their business with a possible view to rate revision.

Mr. Fairgrieve, after describing in general terms some of the conditions that exist to-day in the market for electric vehicles, made the following recommendations:

First—That the central stations run at their expense a series of advertisements in their local newspaper, copy to be educational and impartial.

Second—That the central stations inclose with their monthly statements to clients printed or novelty inserts advising the purchase of electric cars.

Third—That each central station in localities where electric vehicles are used employ in its new-business department a capable man to devote his time exclusively to building up the use of the electric vehicle.

Fourth—That a money appropriation from the N. E. L. A. be prorated among the electric vehicle manufacturers in proportion to the amount that each manufacturer will himself agree to spend for his season's national advertising, with the agreement that each manufacturer so benefiting will devote at least two-thirds of his copy to the general merits of the electric vehicle.

"What Co-operation Means," by E. P. Chalfant, presented in a clear-cut manner the necessity for a rational program of constructive co-operation, financial, physical and educational, between the manufacturers and the central stations. He said:

"The manufacture and sale of electric vehicles represents 100 per cent of our business, and the sale of electric energy for charging these vehicles represents probably less than 5 per cent of the business of the central station; nevertheless, a partnership arrangement for educating the public as to the potentiality of the electric vehicle, and making it easy to own and operate that vehicle, will develop for the industry a volume of business that will return handsome profits to both partners."

The problems of local distribution regarding the respective value of dealers, branch offices and central stations were analyzed minutely by P. D. Wagoner, president of the General Vehicle Company, Inc. Mr. Wagoner was emphatic in stating that the manufacturers should not look to the central stations for actually promoting the sale of vehicles, but rather that it would be to the "best interests of all manufacturers to secure active independent dealers and then for both the manufacturer and the dealer to secure such co-operation from the central station as may be obtainable."

"Charging Problems in Vehicle Selling" was the subject assigned to C. A. Street, but he stated that so far as he was able to find out there was "no such animal."

Following the papers there was a small amount of discussion which paved the way for a resolution by Mr. Chalfant, which is printed here in full, setting forth in definite terms a plan for co-operation between the different interests involved. In discussing the resolution, which was finally unanimously adopted, all who spoke made it clear that it was the consensus of opinion that one man must have charge of whatever plan is actually put in force, that the details of the plan must be clearly and definitely worked out, and that the thing to be sold is, first, electric transportation. It seemed also to be the opinion of the majority that the time was not ripe for a national advertising campaign.

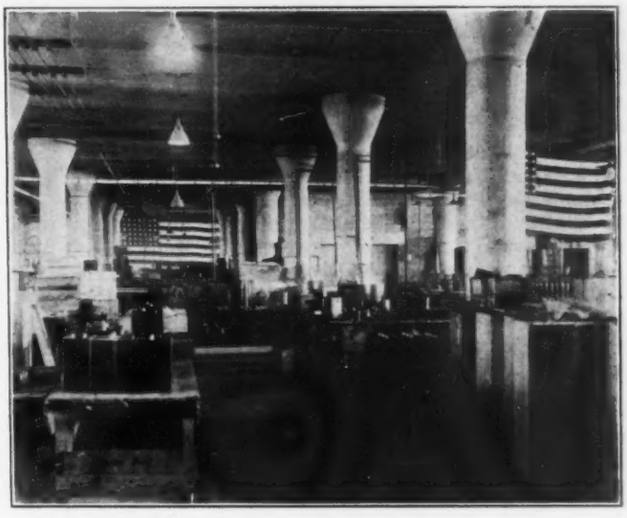
The resolution upon adoption was referred to the Electric Vehicle Section of the N. E. L. A., with the understanding that should that body adopt it in essence a committee should be appointed to crystallize the plan still further and present it to the separate interests.

ELECTRIC STORAGE BATTERY EMPLOYEES RAISE FLAGS

Workers in Every Manufacturing and Office Department of the Works of the Company at Philadelphia Purchase Flags

In every manufacturing and office department of the Electric Storage Battery Company, Philadelphia, the employees, on their own volition, contributed to a fund for the purchase of flags and bunting to decorate their workroom or department.

Addresses were made at several of the flag raisings by an officer of the United States Navy, stationed at the works, who expressed himself as highly gratified at the patriotic spirit shown in every department. At two of the flag-raising exercises a parade with a band formed part of the ceremony.



THE EMPLOYEES FURNISHED THE FLAGS

SPRINGFIELD (MASS.) RAILWAY MAKES POWER CONTRACT

Turners Falls Power & Electric Company Will Furnish Energy to Operate Cars and Will Spend $3,000,000 on Plants

A power contract has been signed by the Springfield (Mass.) Street Railway and the Turners Falls Power & Electric Company, operating an extensive system in the central Connecticut Valley. The Springfield company will purchase the entire input required to operate its cars, and the Turners Falls company will expend, within two or three years, about $3,000,000 for extensions in the Springfield-Greenfield region.

The Turners Falls company plans include the erection of a large modern steam turbine station to supplement the hydroelectric plant built recently at Montague City and other smaller generating stations tied into the system. Supply of power to the Springfield railway will require construction of various motor-generator substations, which will be supplied from the 66,000-volt lines of the Turners Falls company. These are already connected with the steam plant of the United Electric Light Company, Springfield, and when energy is provided according to contract, the engine-driven steam plant of the railway at Springfield will be shut down.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Rate Schedule Approved in Indiana.—The Public Service Commission of Indiana has approved a supplemental rate schedule of the Public Utilities Company of Evansville for energy supplied to Winslow, Ind. The new rates are reductions and grade from 12 cents to 6 cents per kilowatt-hour, the latter charge being for all energy used in any one month over 100 kw.

Electric Rate Proceedings in New York.—The New York Public Service Commission, First District, has decided to continue the proceedings which it started some time ago to investigate the electric rates of the Bronx Gas & Electric Company and of the Westchester Lighting Company in portions of the Bronx which are not served by the New York Edison Company.

Enlarged Jurisdiction for Colorado Commission.—Governor Gunter of Colorado has signed a bill amending the law which gives the commission power to refuse permits for competitive utilities in any district where proper service at reasonable rates is being rendered by an existing utility. It also provides that where a municipality desires to acquire any privately owned public utility it must make application to the commission, which will fix the value of the utility and submit the question of purchase at such price at a special election.

Regulation for Meter and Service Connections in Colorado.—Rules and regulations for gas, electric and water service of private and municipal utilities were adopted by the Public Utilities Commission of Colorado, effective on Jan. 1, 1917. Upon application by the city of Colorado Springs for a rehearing as to the reasonableness of Rule 14, "Meter and Service Connections," the commission suspended this rule until April 1. At a hearing F. J. Rankin, engineer for the commission, recommended that the application of this rule to private and municipal water utilities be suspended indefinitely. The commission was "convinced that rule 14 in so far as it applies to municipally owned and privately owned water utilities should be suspended. In the event the commission shall be called upon in the future to value water utilities, whether privately or municipally owned, for the purpose of establishing reasonable rates, the commission will be free to require the utility to install and maintain service connections in the event the commission makes allowance in the rate structure for this practice."

Deciding Between Two Corporations.—In the matter of the petition of the Colliers Light, Heat & Power Company under Section 68 of the public service commission law for permission to construct in the town of Oneonta an electric plant, poles, wires and appurtenances for transmitting and furnishing to the public electricity for light, heat or power, and for approval of the exercise of rights and privileges under a franchise therefor received from said town, the New York Public Service Commission, Second District, holds: "(1) A corporation should not be encouraged to make extensions of its transmission and distribution lines into a territory which another corporation, by making a much smaller investment of capital for line extensions, can serve equally well, because every reasonable effort should be made to relieve the public from all unnecessary burdens. (2) The making of extensions by one corporation should not be encouraged when they are apparently for the sole purpose of handicapping the operations of another corporation doing business in an adjacent territory. (3) The wishes of the public which is to be served should be taken into consideration in considering the question as to which of two corporations should be permitted to operate in a new territory into which each of them wishes to extend its lines."

Commission Consent Necessary in New York.—In the matter of the complaint of the Colliers Light, Heat & Power Company against the Oneonta Light & Power Company, alleging that the last-named company is unlawfully furnishing to the public electricity in a lighting district at Oneonta Plains, the New York Public Service Commission, Second District, held "(1) An electrical corporation which has no franchise in a municipality cannot begin construction of its plant therein for the sale and distribution of electricity without the consent and approval of the commission notwithstanding that no portion of its plant or distribution system is placed upon, along, or across the public highways of the municipality. (2) An electrical corporation cannot, without the consent of the commission, extend its lines into a municipality in which it has no franchise to carry on its business even though such extensions are entirely upon private property."

Are Gas and Electrical Utilities "Similar"?—Whether the "certificate of public necessity" clause in the law applies to a gas utility entering a field served by an electrical utility is the question that has been raised before the Oregon Public Service Commission by the North Coast Power Company of Portland. According to the North Coast Power Company, the Portland Gas & Coke Company is now laying mains into Washington County from the Multnomah line, and its representatives are canvassing Garden Home and Beaverton for heating and lighting customers. The North Coast company declares that it is now adequately serving this field with electricity, and inquires if the gas company must not secure a certificate of necessity before entering the field. The law provides that before "a similar utility enters a field already served it must obtain a certificate of necessity," and the question arises whether or not a gas and an electrical utility come within the term "similar."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Liability of Telephone Company the Wires of Which Are in Close Proximity to High-Tension Lines.—In action to recover damages for loss by fire alleged to have been caused by a telephone company's negligence in failing to maintain a cable at a proper distance from plaintiff's building and properly to insulate the cable, plaintiff had the burden of proving that the fire was not only caused by the electric current from the telephone company's cable, but that it was due to that company's negligence, the Supreme Court of Errors of Connecticut held (100 A.358). A telephone company in carrying its wires through a city and placing them on poles carrying high-tension wires was chargeable with knowledge that currents of high potential might be brought upon its cables by branches of trees or other conductors coming in contact with such high-tension wires and its own cables, and a very high duty was thus imposed upon it to prevent its wires from carrying such currents into places where injury might result.

Compliance With Ordinance Requiring Underground Distribution.—The Common Council of the city of Albany had power, under the authority conferred upon it by statute and under the conditions incorporated in the municipal gas company's contract with the city, to pass an ordinance requiring that all wires within a prescribed district, with the exception of trolley wires and telephone wires, be put under ground, the limitation of territory and exceptions of wires being within the proper discretion of the Common Council, it was held by the Court of Appeals of New York in the case of Porter vs. Municipal Gas Company of City of Albany (115 N. E. 457). Where an ordinance of a city requiring electric wires to be placed under ground provided that the plans for the conduits should be submitted to and approved by the Commissioner of Public Works before the work was undertaken and the location of the conduits should be determined by him, and where a company, upon application to the commissioner for instructions as to the location of conduits, was told that the commissioner could not approve any location until definite plans had been decided upon for the improvement of the section, the company was not negligent in failing to place its wires under ground as for a failure to comply with the ordinance, the commissioner's refusal to give instructions for the location of conduits being an excuse for failure to obey the ordinance, and the company, in a suit against it for injuries, was entitled to have the jury thus instructed.

May List Cities Service Stock.—President Henry L. Doherty of the Cities Service Company has appointed Warren W. Foster, F. S. Terry and Frank W. Frueauff a committee to take up the matter of changing the par value of the stock and consider the advisability of making application for listing the securities on the New York Stock Exchange.

Outlook for Water-Power Legislation.—One of the recent callers upon President Wilson has been Senator Husting of Wisconsin, who took a leading part in the water-power fight in his State a few years ago. Senator Husting has allowed it to become known that when the water-power bills are introduced at the extra session he will press for a national hydroelectric commission similar to the Ontario commission.

Company at Mount Vernon, Ill., Sold to Frey Interests.—The Citizens' Gas, Electric & Heating Company at Mount Vernon, Ill., operated by Henry L. Doherty & Company, has been sold to the Southern Illinois Light & Power Company, which is controlled by the Frey syndicate of St. Louis. This property was sold because of its isolation from other Doherty operations, being the only one in Illinois, whereas the purchasers control several plants in the vicinity.

Rates Affect Income in New Orleans.—Operating revenue of the New Orleans (La.) Railway & Light Company in 1916 amounted to $7,200,741, an increase of 3.58 per cent over 1915. Net operating income was $2,815,040, a decrease of 8.71 per cent. D. D. Curran, the president, says that the decrease in net income is due mainly to the reduction in electric rates, which became effective on Dec. 1, 1915, and the increase in cost of materials and wages.

Westfield (Mass.) Municipal Plant Investigated.—Whether electricity shall be purchased from an outside company or continue to be generated in the local municipal plant is to be considered by a special committee of the town of Westfield, Mass., following recent investigations brought before a town meeting. Three reports on the administration of the lighting department were presented at the recent meeting, two being by members of a special committee appointed to investigate conditions in the plant, and the third by William Plattner, consulting engineer and manager of the North Attleboro (Mass.) municipal electric department. The committee of investigation consisted of J. D. Cadle, D. F. Doherty and F. Grant. The two first named concluded that as the result of low rates the electrical department of the town has been conducted for several years at a loss; that the gas department has been operated at a profit, and that the latter is accountable for the good showing made by the combined departments. Mr. Plattner's report includes an extended analysis of plant conditions and service. Both the Plattner and the committee reports point out that the town's policy in merchandising appliances, both gas and electric, has been a losing one.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Pacific Gas & Electric Customers.—The Pacific Gas & Electric Company reports that during the year ending Feb. 28 13,342 new consumers of electricity were added to the system; 6646 new gas customers were also added. The totals are now: Gas, 233,736; electricity, 180,626.

Sale of Tidewater Power Company.—William J. Norton of Norton, Bird & Whitman, engineers, Chicago and Baltimore, has concluded the transfer of the utility property of the Tidewater Power Company, Wilmington, N. C., from Hugh McRae, the president, who owned the control of the stock, to Brooks & Company, Scranton, Pa.

Niagara Water Diversion Extended.—The United States Senate adopted on April 18 a resolution extending for another year, or until July 1, 1918, the authority for additional diversions of water in the Niagara River, New York. The resolution was presented by Senator Hitchcock. It had been reported from the foreign relations committee by request of Senator Wadsworth of New York.

Engineering Regulation in Florida.—A bill prepared by the Florida Engineering Society has been received from J. R. Benton, the secretary. It has been introduced in the Legislature and will, it is expected, be passed after unimportant modifications. It is modeled on similar laws enacted in some other States. It provides for the creation and establishment of a Florida State Board of Engineering Examiners, grants certain powers to and prescribes the duties of the board, provides for the examination and registration of professional engineers, regulates the practice of engineering in the State, and provides penalties for the violation of the act.

Reduction in Rates by the Louisville Company.—Beginning May 1, the Louisville (Ky.) Gas & Electric Company will put into effect a two-step reduction in rates for residence service. Consumers who contract on a minimum basis of 3 kw.-hr. per room at the prevailing rate of 8 cents will be entitled to energy in excess of 6 kw.-hr. per room per month at 3 cents net. This applies to city consumers. Outside residence consumers will be given the same terms, except that their initial rate for the first 3 and 6 kw.-hr. is the prevailing suburban rate of 9 cents. Excess energy will be billed at 3.157 cents, but the 5 per cent discount for payment within ten days will reduce it to 3 cents net. It is the belief that this proposal will stimulate the use of home electrical appliances.

New York Civil Service Positions.—Examinations to be held on June 2 by the New York State Civil Service Commission include those for junior assistant in engineering departments, junior electrical engineer of the Public Service Commission of the First District, electrical draftsman and assistant electrical engineer, state hospitals, departments and institutions. All except the last named are open to non-residents. For application forms address the State Civil Service Commission, Albany, N. Y.

Testing Transformer Oils.—The United States Bureau of Standards is co-operating with the American Society for Testing Materials in a study of methods of testing transformer oils for dielectric strength, with the object of obtaining uniformity throughout the industry. Results obtained from various instruments now in use are interpreted differently. An experimental research has been agreed upon, to be conducted by electrical manufacturers and oil producers jointly. Already progress has been made in the experiments.

Generating Stations for South Russia.—Moscow capitalists are organizing a stock company to provide electrical energy for the operation of the coal and other mines and the metallurgical and miscellaneous manufacturing industries of South Russia. A capital of 150,000,000 rubles is proposed. The plan embraces the erection in the Donets coal basin of three stations of 75,000 hp. rating each. It is proposed to transmit power from these stations not only to the mines, but also to the industrial towns and villages and to separate industrial plants. It is not expected that ground will be broken during the war.

Beneficent Patent Laws Aid Progress.—Frederick P. Fish, formerly president of the American Telephone & Telegraph Company, was introduced at a recent meeting of the Boston (Mass.) City Club as the present leader of the patent bar of the United States. In an address Mr. Fish emphasized the cost of developing inventions, many of which have required the expenditure of millions of dollars to carry to commercial form. There have been cases where the whole seventeen years' term of a patent has expired before the arts have advanced to a point where they were ready to accept and absorb the good ideas that were in the patent. A vast majority of the inventions made in this country have been absolutely useless except when employed in connection with other inventions. A man makes an improvement in a steam turbine, and whether he is rich or poor, whether he has a factory or not, he cannot use that improvement except in a steam turbine, and any steam turbine that is useful may have in it 100 inventions. The invention may be useless unless combined with others. The result is that in the development of inventions business capacity, engineering skill and skill of the designer, administrative ability and large capital must co-operate in order that useful results may be produced.

Joint Convention of Iowa Electrical Associations.—May 22 to 25 is the date set for the joint meeting of the Iowa Electrical Association and the Iowa Electric Railway Association to be held in Des Moines.

Cleveland Electrical League.—Attorney John Garfield addressed the members of the Cleveland Electrical League on April 19 on "Who's Who and Why." Morris A. Black, chairman of the Cleveland City Planning Commission, is scheduled to speak on April 26 on the subject of "City Planning."

Handling of Supplies for Central Stations.—F. L. Leitner, storekeeper of the Brooklyn Edison company, addressed the Brooklyn Polytechnic Institute branch of the A. I. E. E. on April 20 on the subject of "Handling Supplies for Central Stations." A. H. Bernhard spoke on "Three-Phase, Four-Wire Distribution."

St. Louis Jovian League.—Asserting that the "personal equation" is the greatest business factor to-day, A. L. Wilson, president of the St. Louis Farm Mortgage Company, delivered an interesting address before the St. Louis Jovian League at the Mercantile Club on April 17, comparing the value of personal efficiency with that of capital and equipment.

Synchronous Club of Los Angeles.—At the annual meeting held in Los Angeles on April 5 thirty-five new members were "synchronized." The table around which the banqueters gathered was arranged in U-shape, and twelve poles arranged along the center line of the tables carried a transmission and distributing system constructed according to state laws for 10,000-volt primary and 2300-volt secondary circuits. Single-phase and three-phase transformers were provided, and current was actually delivered by the system throughout the evening to miniature lamps attached to the poles with standard goose-neck brackets and reflectors. Current was also supplied for lighting three miniature houses along the transmission line. The system was built about one-twenty-fourth actual size.

Station Operating Committee Meeting of the O. E. L. A.—The following papers were presented and discussed at the station-operating committee meeting of the Ohio Electric Light Association, held April 24 at Cincinnati, Ohio. F. R. Brosius of the Union Gas & Electric Company presented a paper on "Some Economies Effected in Power Stations, and Savings Possible." H. L. Lawrence, test engineer for the American Engineering Company of Philadelphia, read a paper on "Stoker Operation as Found in the Ordinary Plant and as It Ought to Be." A paper on "Pressure Drops of Superheaters and Dry Pipes" was read by George Coghlin of the Toledo Railways & Electric Company; "Fire Bricks" were discussed by W. A. Heisel of Charles Taylor Sons Company, and Mr. Pickett of the Dayton Light & Power Company read a paper on "The Effect of Operating Boilers at High Ratings."

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Schenectady Section, A. I. E. E.—"A New Basis for Engineering Education" was the subject of the April 20 meeting of the Schenectady Section of the American Institute of Electrical Engineers. Dr. C. R. Mann of the Carnegie Foundation for the Advancement of Teaching was the speaker.

Oklahoma Gas, Electric & Street Railway Convention.—The sixth annual convention of the Gas, Electric & Street Railway Association of Oklahoma will be held on May 10, 11 and 12 at Oklahoma City, Okla. The following papers will be presented: "Small Plant Operation," "Street Railway Plants and Outdoor Substations," "Ice and Electric Plant Operation," "Oklahoma Fuels," and "Meters and Services." There will also be a question-box session which will afford a clearing house for troubles of utility operators as well as give time for a definite outline of future association policies. A large entertainment program has been planned. L. W. W. Morrow of Norman, Okla., is secretary of the association.

Ohio Electric Light Association.—Developments in insulation and frame-steel towers were the subjects discussed at the first spring meeting of the transmission and distribution committee of the Ohio Electric Light Association, held at Canton, Ohio, April 17. The design of insulators and its importance to transmission were the subjects treated by A. O. Austin, chief engineer of the Ohio Insulator Company, Barberton, Ohio. In this paper special emphasis was laid upon the problem of maintenance of insulators and their importance to a given system. "One point of improvement in the design of an insulator means ten points of improvement or vantage in the transmission system. The problems of insulators on the larger systems are different from those on the small systems, in that the equipment used on a small system would be wrecked if used on a large system. Chances of hazard increase directly with the number of parts of insulator," said Mr. Austin. "A direct decrease in the number of parts of the insulator means a direct decrease in the number of hazards and further means a reduction in internal stresses developed in the insulators. The insulator field has been given to fads, and this has meant trouble in many cases. Operating logs furnish a good means of studying liabilities." R. L. Allen, engineer of the Archbold-Brady Company, Syracuse, N. Y., presented a paper on "Design and Structural Advantages of the A-Frame Steel Tower." Mr. Allen first discussed wind pressure as a factor of line design and gave 15 lb. per square foot (73.2 kg. per sq. m.) as a basis for design. This figure represents a compromise between what would be sufficient to take care of all conditions and what would probably take care of the average condition. Installations made under this specification seem to have been successful from an operating standpoint. The speaker pointed out that while provision for 0.5 in. (1.27 cm.) of sleet has been specified by many engineers in the past, sleet loads have been many times this figure in some cases.

Louisiana Engineering Society.—Preparedness for the defense of the nation was the subject discussed at a joint meeting of the local sections of the American Society of Civil Engineers and the American Society of Mechanical Engineers, held at New Orleans on April 2. This meeting was also attended by many electrical and chemical engineers and army and navy officers. A resolution was adopted to use the Louisiana Engineering Society as a medium through which the services of the large number of technically trained men living in this district could be tendered to the government. A. M. Lockett is chairman of the preparedness committee.

Cleveland Alumni, Massachusetts Institute of Technology.—At the annual banquet of the 300 alumni of the Massachusetts Institute of Technology at the Hotel Statler, Cleveland, Ohio, on the evening of April 21, members of the Technology Clubs, Associated, heard addresses by Frank A. Scott of Cleveland, chairman of the Federal General Munitions Board, and Dr. Charles S. Howe, president of Case School of Applied Science, Cleveland, on the aid that may be given the country by technical men. Mr. Scott said that war is one of the most complex of sciences and that trained brains are the country's greatest resource if they are utilized. Civil experience and ability count for much in time of war, he said. Dr. Howe spoke on military preparation in its broadest sense. He said the man who does conscientious work at home in the production of the things that are used in war is giving his country a service just as much as the one who goes to the front. It requires the work of seven or eight men at home, he said, to support one soldier in the field. Dr. Howe suggested that the government may obtain men of trained minds from the engineering schools. Dr. Hollis Godfrey of Philadelphia, chairman of the Council for National Defense and the newly elected president of the Technology Clubs; Dr. Henry Churchill King, president of Oberlin College, and Dr. Richard Cockburn Maclaurin, president of the Massachusetts Institute of Technology, were other speakers. At a meeting of the executive committee in the afternoon a resolution was adopted providing for the establishment of headquarters at Washington at once. A permanent representative, with a staff, will be located there to carry out the organization's plans for co-operation with the government in the mobilization of technical forces.

Tom Edwards has been chosen to succeed L. C. Hulse as engineer of the Arkansas Light & Power Company at Malvern, Ark.

L. C. Hulse, engineer of the power station at Malvern for the Arkansas Light & Power Company, has been transferred by the company to Magnolia.

Lauren C. Gay has been appointed assistant superintendent of the Bureau of Gas and Electricity of the city of Syracuse, N. Y., succeeding R. W. Grower, who resigned on Feb. 1 to go to Akron, Ohio.

L. A. Wright has been appointed local manager of the San Diego Consolidated Gas & Electric Company at Escondido, Cal., to have charge of the gas and electric utilities in that district recently taken over by the company for operation.

George A. Murch has been appointed manager of the Public Electric Light Company, St. Albans, Vt., and director and superintendent of the St. Albans & Swanton Traction Company, succeeding F. C. Wilkinson, who resigned. Mr. Murch, who is a pioneer in the electric railway field, has built a large number of railways in the East and Middle West.

R. E. Flower, for several years manager of the electric shop of the Union Gas & Electric Company, Cincinnati, has resigned to become manager of the household appliance department of the Erner Electric Company, Cleveland. Mr. Flower was at one time contract agent for the Mobile (Ala.) Electric Company and later assistant commercial manager of the Louisville (Ky.) Gas & Electric Company.

O. C. Roos, who for two years had charge of the radio service of the Philippines, is now in the consulting engineering field in Manila. Mr. Roos has made many contributions to the advancement of radio-engineering, most of which were worked out between 1905 and 1911. One of his best-known contributions to electrical science is the circular diagram for unity power factor in a transformer.

R. J. S. Pigott, formerly construction engineer of the Interborough Rapid Transit Company, motive power department, and for the last two years power superintendent of the Remington Arms Union Metallic Cartridge Company of Bridgeport, Conn., has resigned to become associated with the Sanford Riley Stoker Company. He is retained by the Remington company in a consulting capacity on power and service.

R. J. Busey, formerly a member of the Southwest Engineering Company of Joplin, is now with the Missouri Metals Corporation as electrical engineer at the Mines La Motte, Madison County, Mo. The Mines La Motte are among the oldest lead mines in the country, being operated by the French before the Louisiana Purchase. It has been said that they had some influence in bringing about the acquisition of this territory by the United States.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

N. E. Smith has been appointed to succeed Joseph Pratt as superintendent of outside distribution at the Woonsocket (R. I.) branch of the Blackstone Valley Gas & Electric Company. Mr. Smith, who is a graduate of the Electrical Engineering School of the University of Maine, was formerly employed by Stone & Webster in Boston. He has been with the Blackstone company for five years, starting in the commercial department. Later he was transferred to the engineering department as electrical engineer.

W. F. M. GOSS

Dr. W. F. M. Goss has resigned as dean of the College of Engineering, University of Illinois, to take up the duties of president of the Railway Car Manufacturers' Association. Temporarily he will be at the office of the association, 1120 Frick Building, Pittsburgh, Pa. Dr. Goss is probably best known to the electrical industry in connection with smoke abatement and electrification of railroad terminals in Chicago, he having been chief engineer for the Chicago Association of Commerce committee dealing with these matters. Dr. Goss was born in Massachusetts in 1858 and received his technical education at the Massachusetts Institute of Technology. Upon graduation he became a member of the faculty of Purdue University, where during a large part of the time he was connected with the university he was dean of the engineering school. In 1907 he became dean of the College of Engineering of the University of Illinois. He has a wide association with many of the national engineering societies and is one of the past-presidents of the American Society of Mechanical Engineers. In 1893 he was a member of the jury of awards of the Columbian Exposition at Chicago.

J. J. Flynn has become associated with the department of publicity of the Society for Electrical Development, New York. He was formerly connected with the typographical department of Conde Nast and important agencies.

Carroll H. Shaw, electrical engineer for the Eastern Wisconsin Electric Company, with headquarters at Sheboygan, Wis., has resigned to accept the position of chief engineer of the Minnesota Utilities Company at Chisholm, Minn. Mr. Shaw is a graduate of the Massachusetts Institute of Technology and previous to locating in Sheboygan he was with the engineering department of the National Lamp Works of the General Electric Company at Cleveland, Ohio.

C. R. Richards, professor of mechanical engineering and head of the department since 1911, has been appointed dean of the College of Engineering and director of the Engineering Experiment Station of the University of Illinois, to succeed Dr. W. F. M. Goss, who has resigned to become president of the Railway Car Manufacturers' Association. Dean Richards is a graduate of Purdue University, 1890, and has been successively instructor in mechanical engineering, Colorado Agricultural College, and professor of practical mechanics, professor of mechanical engineering and dean of the College of Engineering, University of Nebraska. Since entering the University of Illinois he has served for two years as acting dean of the College of Engineering during an absence of Dean Goss.

Byron C. Fowles, secretary-treasurer and general superintendent of the Pine Bluff (Ark.) Company, has resigned to take up on May 1 the duties of general manager of the public utilities of Kingsport, Tenn., which include a 200,000-kw. power house and electric distribution, water and sewerage systems, while the erection of gas works is now being contemplated. Kingsport, which is a second Gary, Ind., is being made to order by the Equitable Securities Company of New York, which owns the utilities. Mr. Fowles was graduated from the Spring Garden and Drexel Institutes of Philadelphia and worked on the original Edison plant that was installed in Philadelphia on Sansom Street and connected with the Brush Electric. In 1900 he went to Bay City, Mich., where he rebuilt the Bay City Gas & Electric Company, later going to Richmond, Ind., for rebuilding the Richmond Light, Heat & Power Company. In 1904 he was appointed manager of the Pine Bluff Electric Light, Water & Gas Company. Since Mr. Fowles took over the management of this property it has grown until there are but seventy-nine unwired houses in the corporate limits of Pine Bluff, which had a population in 1910 of 15,102. No successor to Mr. Fowles has yet been appointed. Mr. Fowles was one of the Arkansas Association of Public Utility Operators and its president during 1909 and 1910. He has always taken a very active part in the association's work.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

SHIPBUILDING IN NORTHWEST BOOM TO ELECTRICAL TRADE

Although Greatly Overestimated, the Trade of Shipyards Is Very Much Appreciated by Dealers in Electrical Supplies

A canvass of electrical supply houses in the Northwest as to the effect of the shipbuilding industry on their business brings out some interesting facts. The amount of building shown by the building permits in 1916 was very low, and the first three months of 1917 are even lower than in 1916, but the loss of business in electrical supplies due to the small amount of ordinary normal building has been made up by the electrical material purchased by shipbuilders and boiler works and by machine shops which are by-products of the shipbuilding industry.

There are five shipbuilding plants in Seattle, two yards building wooden ships in Tacoma, and ground is being prepared for a yard to build steel ships in Tacoma for the Todd interests. In Olympia there is one yard building wooden boats. There are two yards starting at Aberdeen with the idea of building wooden boats, and there is one starting in Everett and another in Bellingham with the intention of building wooden boats. It is the opinion of the conservative banking elements that the present boom will be over in from two to three years, at which time there will not be more than two plants able to operate at a profit. Electrical supply houses are hoping that building will become normal at that time.

The amount of electrical material used in steel and wooden boats is greatly overestimated. It consists mostly of conduit, wire, sockets, lamps, marine fittings, etc. A great many of these items are of such size that they are difficult to secure promptly from the factory and have necessitated a rearrangement and readjustment of the jobbers' stocks. Under the present circumstances the shipbuilding companies constitute a class of trade that is very highly appreciated by the electrical supply houses.

DEMAND FOR INDUSTRIAL TRUCKS IS INCREASING

Labor Shortage and Necessity for Increased Production the Important Factors in Creating This Market

Labor shortage and the demand for increased production have united in creating a steadily increasing market for electric industrial trucks. Already this market has assumed considerable proportions and manufacturers are getting behind with their orders.

Last year was a good year for industrial trucks, but this year so far is much better. With the present prospect of a large labor shortage it becomes evident that more machinery of a labor-saving nature must be employed by industrial establishments in order to keep up with production. Labor now is very scarce, although somewhat easier than it was a few months ago; but it is anticipated that when farming operations begin on a larger scale and when the government calls for a large body of men for the army industrial establishments will be greatly handicapped unless some means is provided for taking care of the work formerly handled by a larger force.

Terminals, freight yards, shipping centers and docks, in addition to industrial establishments, are calling for large numbers of trucks. Increased transportation, both domestic and export, has called for greater facilities for handling goods in transit at terminal points. Battery and motor manufacturers report a large increase in business for this class of trade.

The value of the industrial truck can well be appreciated when it is understood that for handling bulk goods one truck easily displaces a number of men. The electric truck has no competition, and the demand has come from the customer largely without solicitation.

The delivery of trucks is being held up somewhat, owing in a degree to the large increase in business, but more especially to the condition of the market for raw materials and for parts. Motor manufacturers and battery manufacturers are working at capacity limit, and truck producers therefore must take their turn with the rest of the buyers of this class of equipment. Besides, steel shapes and castings are particularly difficult to obtain.

BIDDING FOR BUSINESS OF TWO YEARS HENCE

Part That Advertising Plays in Establishing a Permanent Background for the Future When Competition Will Again Be Keen

Comparatively few manufacturers at the present time have developed any far-sighted policy in connection with their advertising. In spite of the fact that practically all manufacturers of electrical goods—and the same can be said of other manufacturers—have now more business than they can conveniently turn out, little attention by means of advertising is being paid to the business of years to come. For the most part what advertising is now being done is of the same general nature as advertising in normal times.

Economists all agree and it is logical to believe that the present volume of business activity cannot be maintained, and that after the war, in a period variously estimated from a few months to two or three years, business will again have reached a level that is below the total capacity of the plants and where competition will again be keen. As an insurance against this condition, manufacturers have been urged time and time again to adopt a far-sighted policy and advertise in a way that will impress the name of their product upon the minds of the buying public. That such a policy has been so little followed is almost unexplainable in this day of national preparedness. Manufacturers, however, who have been interviewed on this subject have almost all stated that they have been too busy to pay any attention to advertising. They had all the business they could conveniently take care of at the present date, and so far as the future was concerned there was plenty of time to think about that. Such ideas, while exceedingly short-sighted, are nevertheless very prevalent to-day.

Some manufacturers, of course, have realized that the future will depend largely upon the degree to which buyers know their goods, and for that reason have directed their advertising of late into channels designed not to influence the buyers of to-day but those of a few years from now. Prominent among these has been one of the largest electrical manufacturing concerns, which for some time has been conducting an educational campaign the results of which are expected to appear months and years from now. In announcing this policy to its different officers this company made the following statement:

"When we are loaded up with business we nevertheless understand that additional business will be needed eventually. We advertise, therefore, to interest others in coming to us with their future plans, so that we will be making our future plans accordingly."

SECOND-HAND MARKET IS STRONG ON LARGE APPARATUS

Available Equipment in Excellent Condition Generally, the Poorer Stuff Finding Its Way to the Metal Scrap Pile

Although deliveries on most manufactured products have been set back a month or two months, because of the government's demands on the industries of the nation, no appreciable effect has been felt by the second-hand merchants of electrical goods except for very large apparatus, the demand for which has been enhanced to an appreciable extent. Second-hand dealers continue to experience a large demand for practically all classes of equipment. There is no shortage at the present time of second-hand electrical apparatus except for large equipment, such as large induction motors, rotary converters, transformers and turbines.

Steam engines, it is understood, are a drug on the market, there being no demand for this class of equipment.

The demand for direct-current motors continues large, and it has been noticed that manufacturers are no longer particular regarding the type of equipment they obtain so long as it will do the work and can be had quickly. For this reason there are many direct-current motors on the market that had previously been taken off central-station lines in the country-wide endeavor to increase alternating-current and decrease direct-current distribution.

The available machinery is for the most part in excellent shape. There is, of course, some poor stuff coming out, but, owing to the price of copper, it has been found to be more profitable to break the machines up for old metal than to attempt to rewind them or otherwise repair them to put them in good operating condition.

The second-hand market in the future, in all probability, will depend largely on the copper market. If the price of copper continues high it is the belief of those engaged in the trade that second-hand dealers should experience an excellent business. On the other hand, should a readjustment of the copper market bring prices down nearer their former level in normal times, the indications then point to a poor second-hand market.

Dealers, it is found, are now hesitating about laying in large stocks of second-hand equipment owing to the uncertainty of the copper market. Should stocks be laid in at the high prices of to-day and the copper market fall off considerably, the loss to second-hand men would, according to the degree of speculation, wipe off profits otherwise earned.

EFFECTS OF SUBMARINES SEEN IN FEBRUARY EXPORTS

Trade for the Month Totals Up to Only $3,526,269 as Compared with $4,912,924 for the Month of January

Exports of electrical goods were less in value in February than in any month since last July. The February exports amounted to $3,526,269, or about $1,400,000 less than in January. In comparison with February, 1916, however, there was an increase of $1,000,000.

Exports of fans and meters were both record-breaking in February, the former reaching a value of $66,243 and the latter of $105,943. The items which, in comparison with the previous half year, showed the largest decreases were insulated wire and cable, motors and miscellaneous merchandise. Exports of the latter were over half a million dollars less in February than in January.

For the eight months ended February, 1917, the exports of electrical goods totaled $31,744,237, in comparison with $18,151,223 for the corresponding period ended February, 1916, and $12,205,421 for that a year previous.

The total exports for the first two months of the current year amounted to $8,439,193, as compared with $5,163,433 for the first two months of 1916. Should the exports for the remainder of the year keep up at this rate, the 1917 figures will total over $50,000,000.

Evidences are seen in the February figures of the activities of the German U-boats. In February, it will be remembered, the German government threw all restraint to the winds in the prosecution of its intention to destroy shipping bound for Europe. Besides deterring many American manufacturers from shipping their goods, there grew up on the Atlantic coastboard a very serious congestion of freight, resulting in embargoes being placed on goods of a certain nature destined for export. The result, as seen in the accompanying figures, was an appreciable contraction in the foreign trade of the United States. That February is a short month may of course account for some of the decrease, but only a small part.

In the accompanying table are shown detailed figures of electrical exports as compiled by the Bureau of Foreign and Domestic Commerce:

	February		Eight Months Ended February	
Articles	1916	1917	1916	1917
Batteries	$104,712	$227,105	$926,924	$1,769,158
Dynamos or generators	112,965	277,953	965,713	1,744,064
Fans	30,637	66,243	234,466	254,764
Insulated wire and cables	217,764	526,879	1,919,157	4,557,567
Interior wiring supplies, etc., including fixtures	133,500	72,524	628,971	696,196
Arc lamps	1,761	842	12,168	7,793
Carbon-filament lamps	12,898	13,248	115,893	96,950
Metal-filament lamps	107,715	153,475	792,079	1,048,174
Meters and other measuring instruments	59,170	105,943	508,121	681,977
Motors	439,769	335,093	2,722,811	3,602,232
Telegraph instruments, including wireless apparatus	2,542	18,324	96,117	191,712
Telephones	105,176	157,796	554,108	1,155,108
Transformers	86,414	84,105	606,949	740,446
All other	1,097,631	1,486,739	8,067,746	15,198,096
Total	$2,512,654	$3,526,269	$18,151,223	$31,744,237

COPPER QUOTATIONS CONTINUE TO FALL OFF

Traders Are Awaiting the Readjustment of the Market—Consumers Are Disposing of Surplus Stock at a Profit

With but little business being done, and that mostly in spot copper, nominal market quotations continue to fall off. In fact, it is known that many sales have been made under the market. A readjustment of the copper market is anticipated, and when this occurs buyers and sellers will have a more definite idea of existing conditions.

Little activity has been manifest in the market. Some manufacturers with an over-supply of copper are taking a profit on their surplus. The amounts that change hands, however, are not large. Until the market becomes readjusted it is doubtful if there will be much purchasing on long deliveries.

Nominal market prices on Tuesday of this week for electrolytic were as follows: April, 30.5 cents; May, 29.75 cents; June, 28.75 cents; third quarter, 25.5 cents; fourth quarter, 24.5 cents.

NEW YORK METAL MARKET PRICES

	April 17 Selling Prices Bid	Asked	April 24 Selling Prices Bid	Asked
Copper:	£ s d		£ s d	
London, standard spot	135 0 0		130 0 0	
Prime Lake	32.00 to 32.50†		30.50	to 31.00
Electrolytic	31.50 to 32.00†		30.00	to 31.00
Casting	29.00 to 29.50†		26.75	to 27.25
Copper wire base	38.00 to 38.50†		37.50	to 38.00
Lead	9.00		9.00	
Nickel	50.00		50.00	
Sheet zinc, f.o.b. smelter	21.00		21.00	
Spelter, spot	9.55 to 9.80		8.92½ to 9.17½	
Tin, straits	55.37½†		57.50†	
Aluminum, 98 to 99 per cent.	56.00 to 58.00		56.00	to 58.00

OLD METALS

Heavy copper and wire	27.50 to 28.00		25.50	to 26.50
Brass, heavy	16.50 to 17.00		16.00	to 16.50
Brass, light	12.50 to 13.00		12.00	to 12.50
Lead, heavy	7.50 to 7.75		7.50	to 7.75
Zinc, scrap	7.50 to 7.75		6.25	to 6.50

†Nominal.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Dead-Front Panels

Dead-front distributing panels with push-button switches are being marketed by the Bryant Electric Company of Bridgeport, Conn. In general the switches have a porcelain base recessed to accommodate the standard two-button switch mechanism, of which two are

DEAD-FRONT DISTRIBUTING PANEL

provided for each unit. Provision is also made for fuse plugs for each line to the switch. All connections and conductors are concealed and separated from the front of the panel by a continuous sheet of insulating material, hence no live parts can be exposed. Moreover, the sheet-metal front of each unit has an overhanging edge which engages with the front of the adjoining unit, thereby effectively preventing accidental contact with any live parts. In case the switch mechanism requires adjustment the cover of the particular unit can be readily removed and the switch mechanism lifted from its socket. The switch mechanism can be replaced or a new one substituted just as readily and quickly, it is said. These dead-front panels with push-button switches can be furnished in double-pole, single-branch, double-pole, double-branch and triple-to-double pole, double-branch types.

Over-Voltage Protective Device for Regulators

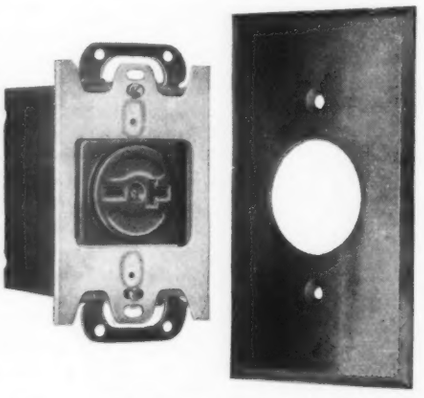
To prevent excessively high voltages caused by voltage regulators overboosting when a short circuit is removed from a system the Westinghouse Electric & Manufacturing Company has developed a device which is applicable to any contact-making type of alternating-current generator voltage regulator.

The device consists of an under-voltage relay in combination with a direct-current magnetic vibrator connected in the main contact circuit of the alternating-current generator voltage regulator, as shown. The contacts of the direct-current vibrator and the relay are connected in parallel, the pair being in series with the main contacts of the regulator. The vibrator magnet is energized from the exciter bus, and the relay from the potential transformer supplying the regulator.

When a short circuit occurs on a system equipped with this protective device, the main contacts of the regulator immediately close, and the under-voltage relay contacts open, owing to the drop in alternating-current voltage. As soon as the exciter voltage builds up to the point for which the direct-current vibrator is adjusted the vibrator contacts operate and regulate the exciter voltage in the same manner that the regulator contacts normally do. Thus the exciter voltage under short-circuit conditions can never rise above the predetermined point, which is usually set a little above the no-load excitation value required by the alternating-current generators. When the short circuit is relieved, therefore, no excessive field current exists to produce a dangerous increase in the alternating-current voltage. The moment the alternating current rises above the setting of the under-voltage relay, the contacts of this relay close and bring the regulator back into service.

Receptacle Aligning Plate

Harvey Hubbell, Inc., of Bridgeport, Conn., has developed a receptacle of the standard interchangeable type equipped



LEFT — STANDARD INTERCHANGEABLE-TYPE RECEPTACLE AND ALIGNING PLATE ATTACHED. RIGHT—BRASS FLUSH PLATE

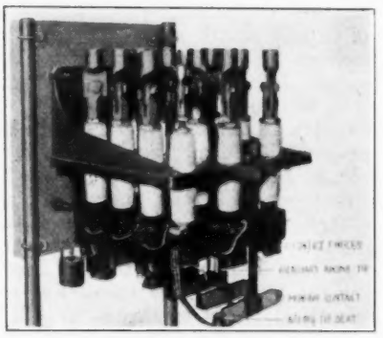
with a special aligning plate as shown in the accompanying illustration. The use of this combination, it is claimed, makes it possible to secure positive alignment before attaching the brass flush plate. Elliptical slots in the aligning plate, through which the screws pass to the outlet box, allow free movement for aligning and adjusting to wall variations. This plate overhangs the edges of the outlet box and fits flat against the wall, giving greater security to the receptacle and increased rigidity to the "struck-up" flush plate shown herewith. This plate affords protection from dust and dirt to the outlet box and receptacle plate while the building is under construction.

Wire and Cable Grip

Wire and cable grips made of cast-steel wire of coarse strand are offered to the trade by the Norris Electric Specialties Company, Inc., of New York City. The flaring ends of the device form a funnel-shape entrance for the cable ends. The wire grip is not limited to use with a single wire or lead-covered cable. It can be used to pull in a three-wire feeder or a number of wires such as would be required in a signal system. It is claimed by the manufacturer that this grip will not destroy lead-covered cable in the pulling operation. The device is made in single-eye, double-eye and double-eye split-grip styles.

Auto Starters

Three types of auto starters have been developed by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., for use in connection with the operation of large squirrel-cage induction motors up to 650 hp. Resistance can be furnished in connection with these starters to prevent opening of the circuit when changing from starting to running position, an operation which oftentimes causes disturbances that may be injurious to both motor and starter. The effect of arcing has been reduced to a minimum, the manufacturer claims, by immersing all contacts in oil and by using either auxiliary arcing tips or large-contact surfaces on the main contacts. For service where arcing occurs the contacts are provided with removable tips which may be renewed readily with a pair of pliers. The starting current may be adjusted by taps on an auto-transformer, which provides either three or eight



ONE TYPE OF AUTO STARTER

starting voltages, according to the capacity of the transformer. Safety to the operator is assured by excellent insulation in the switch and by a very liberal margin of safety above actual requirements. Safety to the apparatus

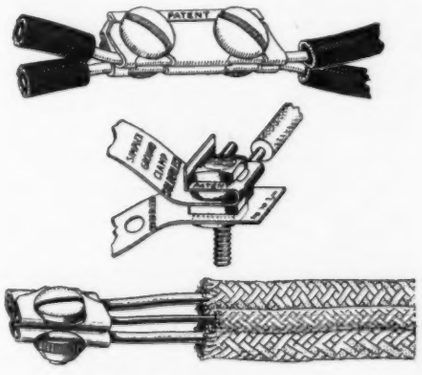
is assured by overload relays, which cause the switch to open at a predetermined overload, and by a low-voltage relay which opens the switch when the service is interrupted.

The three types of starters meet the requirements of a wide range of operative conditions. The type Q starter is for use on two-phase and three-phase circuits operating at 220 to 2200 volts and 25 to 60 cycles. The types QF and QF-1 are for use with motors of larger capacity or higher voltage than can be started by the type Q starters. They differ from the latter mainly in their ability to handle larger currents and in having larger kva. breaking capacity, and, in certain sizes, a preventive resistance. They also have two handles, one for starting and the other for running.

In starting a motor with the type Q auto starter, the switch handle is moved from the "off" to the "full" position, and held there until the motor has ceased to gain speed. It is then moved downward as far as it will go, to the "running" position, where it will remain. The handle will not remain in the starting position unless held, and it is impossible to move the handle directly from the "off" to the "running" position without first passing to the starting position. Where a type QF or QF-1 auto-starter is employed, having no preventive resistance, it is necessary to move the starting handle down as far as it will go and hold it there until the motor has ceased to gain speed. That handle is then released, and before it has fully returned to the "off" position the running handle is moved down as far as it will go, where it will remain latched. If a preventive resistance is used, the starting handle is held down until the motor no longer gains speed; then the running switch is closed and the starting switch released.

Solderless Wire Clamp

Wire-clamp connectors for circuits, fixtures and grounding purposes which are designed to connect four wires or



THREE TYPES OF CLAMPS

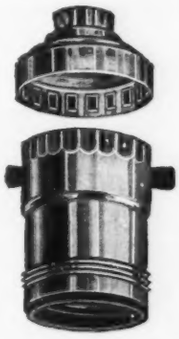
less of different sizes without the use of heat are being offered to the trade by Alexander B. Simpson of New York City. To connect the wires the screws of the device are loosened slightly and each wire is inserted in one of the four loops and securely connected by tightening the screws. A knurled surface is provided on the nut threaded on each screw so it will grip the wire and not turn when the screw is drawn up. These connectors are also made for grounding work.

Bicycle Headlamp

Bicycle headlamps equipped with tungsten units accurately focused have been developed by the Metal Specialties Manufacturing Company of Chicago. A bayonet type of switch is provided at the back of the lamp, where the lamp can be controlled at the will of the rider. The battery container is made of steel of waterproof construction and held in place by three leather straps. The lamp-head bracket is made adjustable so that it will fit any handle bar. This line of lamps includes eight different styles.

Push-Through Socket

Push-through sockets manufactured by the Arrow Electric Company of Hartford, Conn., have a quick make-and-break switch mechanism and a rating of 660 watts at 250 volts, which is usual with that type of socket. This type belongs to the Arrow E 20 socket



INTERCHANGEABLE PUSH-THROUGH SOCKETS

line and is therefore interchangeable with fourteen different body parts and fifteen different caps. These sockets have threaded beads for "Uno" shade holders and can be equipped with the Arrolock attachment to prevent the removal or theft of lamps.

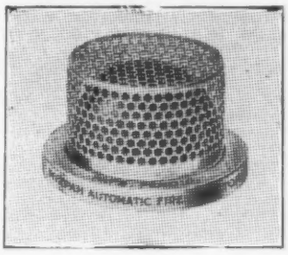
Electric Kitchenette

A compact combination electric range for small apartments, kitchenettes and buffets has been developed by the National Electric Utilities Corporation of New York City. This range consists of two compartments, a broiler and an oven. A grid is permanently placed in the upper section of the broiler. The heat is confined and thrown downward by means of a baffle plate or reflector placed on top. For convenience the latter is fitted with a handle.

When used for building, the baffle plate is placed in a slide underneath the heat unit, inside the broiling compartment, thereby deflecting the heat upward to a circular plate on top. For baking and roasting, the baffle plate remains in place inside the broiler, and the oven is substituted for the top plate and lid. The temperature may be adjusted by means of a three-heat snap switch conveniently placed on the lower panel of the broiler. The power demand at high heat is 2000 watts; at medium heat, 1000 watts, and at low heat, 500 watts.

Automatic Fire Detector

A device for announcing fire danger, which closes an electric circuit upon a sudden rise of temperature, is being



EXPANSION OF AIR CAUSES FIRE DETECTOR TO CLOSE CIRCUIT

made by the Automatic Fire Detector Company of 1834 Broadway, New York City. The instrument consists of a brass shell incased in a metal guard and base which is provided with electrical connections and contact point. The shell contains 1.5 cu. in. (24 cu. cm.) of air, and with normal atmospheric changes the expansion of air is provided for by means of an adjustable vent.

Heat waves from a fire cause the air in the brass chamber to expand rapidly, forcing a taut diaphragm to bend out and close an electric contact. The detector is designed for mounting in any position, and the makers state that neither vibration nor jar will affect its operation. In connection with an annunciator and bells (or lamps) the instruments may be arranged to register at a central point the exact location of a fire.

Portable Electric Drill

A line of fan-cooled electric portable drills has been brought out by the James Clark, Jr., Electric Company of Louisville, Ky. These drills are made in seven sizes, ranging from ¼ in. to 1½ in. (0.63 cm. to 3.8 cm.). Drills for direct current may be had only in sizes up to 1¾ in. (4.4 cm.). The drill spindles are made of high-grade, heat-treated steel, which is turned and ground. Heat-treated nickel-steel grease-incased gears are provided. The three largest universal drills embody all the general features of construction of the large direct-current drills, having aluminum frames and ball thrust, while all electrical parts are completely inclosed and protected from injury.

Trade Notes

THE ST. LOUIS (MO.) ELECTRICAL WORKS have changed their address to 4060 Forest Park Building.

THE RAILWAY CAR MANUFACTURERS' ASSOCIATION has established an office at 61 Broadway, New York City, room 2216.

THE A. D. GRANGER COMPANY announces the removal of its offices to 1608-1611 Park Row Building, 15 Park Row, New York City.

C. H. ROBERTS has been appointed comptroller of the Hess-Bright Manufacturing Company, Philadelphia, Pa. He was formerly factory accountant.

THE SAFETY-ARMORITE CONDUIT COMPANY has removed its New York office to 511 West Twenty-seventh Street, where it will be in connection with the company's new warehouse.

A. HALL BERRY is removing his office to 71-73 Murray Street, New York City. Owing to increase in business and having taken on additional lines Mr. Berry found it necessary to take larger quarters.

THE ROBBINS & MYERS COMPANY, Springfield, Ohio, has just issued the first number of a semi-monthly factory organ published for its employees and customers. Temporarily, at least, this new publication will be known as "The R. & M. Breeze."

POOLE ENGINEERING & MACHINE COMPANY, BALTIMORE, MD., recently acquired the exclusive manufacturing and selling rights of the turbo-gear formerly manufactured by the Turbo-Gear Company, Inc., also of Baltimore, through consolidation.

THE ELECTRIC MOTOR EXCHANGE has opened offices at Miami, Fla., and will engage in selling new and second-hand electrical machinery, fans, lamps and electric fixtures. The company would like to receive catalogs from electrical manufacturers.

THE JEFFERSON ELECTRIC MANUFACTURING COMPANY has moved into larger quarters at 426-430 South Green Street, Chicago. The company announces that T. C. Hawkins has recently joined its sales department with headquarters at the home office.

CHARLES M. CROFOOT has been transferred from the post of district sales manager for the Cincinnati district office of the Federal Sign System (Electric) company to the New York City office. A farewell dinner was given to Mr. Crofoot on March 30 by F. D. Lawrence, president of the F. D. Lawrence Company.

C. H. HOLDEN has been made central district manager for Edwards & Company, Inc., of New York City, and has established a sales office at 9 South Clinton Street, Chicago, Ill. Mr. Holden was formerly sales manager for the P R Manufacturing Company of Detroit, Mich., and has had long experience in the sale of electrical specialties.

THE YOUNGSTOWN SHEET & TUBE COMPANY has given notice that the Andrews & Hitchcock Iron Company of Hubbard, Ohio, and the Western Conduit Company of Struthers, Ohio, heretofore known as subsidiaries to the Youngstown Sheet & Tube Company, have now been dissolved and will be known as the Youngstown Sheet & Tube Company.

C. W. FORBRICH and J. H. Burton announce the formation of the Forbrich-Burton Advertising Service, Inc., Monadnock Block, Chicago, for the purpose of serving advertisers, particularly those catering to electrical, mechanical and allied fields. Both Mr. Forbrich and Mr. Burton have been connected with trade and technical papers in these fields for many years.

ROBERT GRIMSHAW, special agent of the Bureau of Foreign and Domestic Commerce, will visit early in June the principal South American countries to investigate the markets there for certain lines of American manufacturers; also to report on the methods adopted in the various countries for getting bids and awarding contracts for government and municipal supplies, especially electrical. Before departing he would like to learn from electrical and other manufacturers the principal difficulties that they have experienced in bidding on supplies in South America. His address is Room 409, Custom House, New York City.

THE CUTLER-HAMMER MANUFACTURING COMPANY, Milwaukee, Wis., calls attention to the fact that there seems to be some misunderstanding in relation to the operation of the plants of the company because of news items that have appeared in different publications announcing the enlistment of employees in the Naval Coast Defense Reserve. It is pointed out that the condition in the Milwaukee plant at the present time is that out of some 2000 people approximately 400 shopmen and some 40 in the testing room, engineering department and office force are enlisted in the Naval Reserve. There has been absolutely no interference with the progress of the work in the shop by the navy officials, it is stated, nor is any anticipated, since this number of men would be ample to meet even emergency requirements of the navy.

THE HOTPOINT CLUBHOUSE.—The new Hotpoint Club headquarters at the factory of the Hotpoint Electric Heating Company in Ontario, Cal., will be opened formally in the special spring festival on May 1. The Hotpoint Club is composed of every member on the payroll of the Hotpoint company at the Ontario office. No dues are required; all persons entering the employ of the company automatically become members of the club. The club operates a cafeteria where lunch is served at the noon hour and where the midnight lunch is served to the night shift. The club also operates a grocery store on a co-operative basis, thus enabling employees to purchase their staple groceries at from 10 to 15 per cent below regular retail store prices. The grocery store also handles fruits and vegetables which are raised by the employees and which can be marketed through the store without any expense except the nominal charge necessary to maintain the employee in charge of the store. The company takes no part in the management and operation of either the cafeteria or the store, except to assist where necessary in financing, and to supply suitable quarters and equipment at a very nominal charge. The new clubhouse will contain both the cafeteria and the store, as well as the large assembly room, caretaker's quarters, and a ladies' rest room. The clubhouse is so arranged that meals can be served on the porch during the summer time.

Trade Publications

SOCKETS.—The Arrow Electric Company of Hartford, Conn., is distributing a leaflet descriptive of its interchangeable push-through socket.

SWITCH PLATES. — The Chattanooga (Tenn.) Stamping & Enameling Company is distributing a leaflet descriptive of its porcelain enamel switch plates.

ELECTRIC APPLIANCES. — Landers, Frary & Clark of New Britain, Conn., are distributing an illustrated folder descriptive of their Universal heating devices.

LIGHTING.—The National Lamp Works of the General Electric Company, Nela Park, Cleveland, have prepared bulletin 28, descriptive of show window lighting.

WASHING MACHINES. — The Northwestern Electric Equipment Company of New York City is distributing a leaflet descriptive of its Baby Geyser electric washer.

FAULT-FINDING INSTRUMENTS. — The type F Matthews Woodpecker Telefault is illustrated and described in a folder recently issued by W. N. Matthews & Brother of St. Louis, Mo.

REFLECTORS. — The National X-ray Reflector Company of Chicago is distributing a bulletin entitled "How to Know and Have Good Lighting." Illustrations of well-known places which use X-ray reflectors are given.

SWITCHES.—The South Bend (Ind.) Current Control Company is distributing a folder descriptive of its R. C. O. C. switch, a remote-control oil-circuit switch for control at the power house of multiple or series ornamental street-lighting systems, etc.

INSULATING MATERIAL.—The Dielectric Manufacturing Company, St. Louis, Mo., has issued a catalog on insulations, technical paints and varnishes, which, in addition to listing its products, contains useful curves showing the electrical characteristics of various insulating materials.

STEAM JET CONVEYOR SYSTEM.—The American Steam Conveyor Corporation, 326 West Madison Street, Chicago, has issued a thirty-two-page booklet giving a general description of American steam jet conveyors, showing detailed views of the fittings used in this system, blueprints illustrating the system installed in different types of power plants, and photographs of numerous central station and industrial plant installations of the system. The booklet also states that the cost of handling ashes by this system varies from 4 cents to 10 cents as the cost of coal per ton varies from $1 to $3.10.

New Incorporations

THE ECONOMY POWER APPLIANCE COMPANY of Tomah, Wis., has been incorporated with a capital stock of $10,000 by W. A. Lee, E. H. Manning and William B. Naylor.

THE SWARTZ ELECTRIC COMPANY OF THE PACIFIC COAST of Spokane, Wash., has been incorporated with a capital stock of $50,000 by John H. Morgan and M. L. Morgan.

THE NORTH ELECTRIC MANUFACTURING COMPANY of Galion, Ohio, has been incorporated by C. H. North, Carl J. Gugler, C. H. Steele, and others. The company is capitalized at $1,000,000.

THE E. G. LIGHT COMPANY of Allendale, Ill., has been incorporated with a capital stock of $8,000 to supply electricity in Allendale. The incorporators are: Elijah Greathouse, A. Greathouse and E. Campbell.

THE A. T. VICK COMPANY of Houston, Tex., has been incorporated with a capital stock of $10,000 by A. T. Vick, P. S. Grogan and R. W. Franklin. The company proposes to deal in electrical and heating apparatus.

THE CHILHOWIE (VA.) LIGHT & POWER COMPANY has been chartered with a capital stock of $5,000 to supply light and power in Chilhowie. J. D. Tate is president and W. P. Vaughan is secretary and treasurer.

THE STAROBIN ELECTRICAL SUPPLY COMPANY of New York, N. Y., has been chartered by Joseph Starobin, Samuel Levine and M. Levine. The company is capitalized at $30,000 and proposes to deal in electrical fixtures and supplies.

THE HUNTLEY ELECTRIC COMPANY of Brooklyn, N. Y., has been incorporated with a capital stock of $2,500 to do a general contracting and electrical business. The incorporators are: Julia R. Roth, Samuel Randel and M. A. Franklin.

THE FRANK NASON ELECTRIC COMPANY of Boston, Mass., has been incorporated with a capital stock of $50,000. The officers are: Frank W. Nason, president; John W. Nason, treasurer, and Gladys M. Nason, clerk, all of Dorchester, Mass.

THE ONEONTA (ALA.) UTILITIES COMPANY has been incorporated with a capital stock of $4,000 by J. D. Harvey, W. A. Weaver, P. B. Hale and A. A. Fendley. The company proposes to operate an electric plant and ice factory in Oneonta.

THE HAMLIN (TEX.) LIGHT, POWER & ICE COMPANY has been incorporated by A. V. Wainwright, R. F. Price and F. A. Matthes. The company is capitalized at $60,000 and proposes to construct and operate an electric-light and power plant and ice factory in Hamlin.

THE PORT REPUBLIC (VA.) ELECTRIC LIGHT & POWER COMPANY has been incorporated with a capital stock of $5,000 to supply electricity for lamps and motors in Port Republic. J. H. Lamb is president and W. L. Dinsmore is secretary, both of Port Republic.

THE FERMANAGH (PA.) TOWNSHIP ELECTRIC COMPANY has been chartered with a capital stock of $5,000 to supply electricity in the township of Fermanagh. The incorporators are: A. J. Musser, M. S. Mitchell and P. T. Davis, of Clearfield. The offices of the company are located in Bellefonte, Pa.

THE WHEATFIELD (PA.) TOWNSHIP ELECTRIC COMPANY has been incorporated with a capital stock of $5,000 by A. J. Musser, M. S. Mitchell and P. T. Davis, of Clearfield. The company proposes to supply electricity in the township of Wheatfield. The head office of the company will be located in Bellefonte, Pa.

THE RAILWAY ELECTRIC SWITCH & SUPPLY COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $1,500,000 to manufacture and sell electrical railway switches, etc. The incorporators are: Wilber A. McCoy, of Pittsburgh, Pa.; Charles H. Jones and W. I. N. Lofland, of Dover, Del.

THE GREENE COMPANY of Corning, Cal., has been incorporated with a capital stock of $10,000 to do a general construction, electrical and mechanical contracting business and also to deal in electrical supplies and fixtures of all kinds. The incorporators are: A. E. Greene, William Dale, H. R. Salisbury, C. B. Fergus, C. G. Sutton and Marshall DeMotte, all of Corning.

New England States

CLAREMONT, N. H.—Preparations are being made by the Claremont Power Company for the erection of a new high-tension (44,000 volts) transmission line from Claremont to Charlestown, for which most of the right of way has been secured. This line will connect with the transmission system of the Connecticut River Power Company.

NORWOOD, MASS.—Work has begun on the foundation for the addition to the municipal electric-light plant, 25 ft. by 42 ft., to cost about $5,000.

SPRINGFIELD, MASS. — Negotiations are under way by the Springfield Street Railway Company for the purchase of energy from the Turners Falls (Mass.) Power & Electric Company. The proposed changes will involve an expenditure of more than $1,000,000. Under the proposed arrangement it is understood that the Turners Falls Company will take over the Margaret Street power station, now the chief source of supply for the street railway system, and equip and operate it as the main substation. Large substations will be established on the west side of the Connecticut River, on the company's property near Main and Carew streets, in Chicopee and in Ludlow.

WESTFIELD, MASS.—Franchises over various properties in the town of Westfield have been secured by the Turners Falls (Mass.) Power Company.

DIAMOND HILL, R. I.—Plans are being considered for the installation of an electric-lighting system in Diamond Hill. It is proposed to tap the transmission line which the Blackstone Valley Gas & Electric Company of Woonsocket is erecting from Woonsocket to Plainville, Mass., which will pass through the town.

Middle Atlantic States

BRONXVILLE, N. Y.—The Lawrence Park Heat, Light & Power Company of Bronxville has applied to the Public Service Commission for permission to construct and operate an electric light and power plant and steam plant under franchises granted by the village of Bronxville.

BROOKLYN, N. Y.—The chief of the Bureau of Yards and Docks, Navy Department, Washington, D. C., is having plans drawn for a shop building, 300 ft. by 600 ft., one and two stories, for the Brooklyn Navy Yard, to cost approximately $1,000,000.

BROOKLYN, N. Y.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C,. until May 1 for furnishing coaling bags, blades for Curtis turbines, blowers, lamp and telephone cord, crucibles, coal tar, etc., oil lamps, dough-mixing and kitchen and cake machines, and electric wire and cable, etc., at the navy yard, Brooklyn.

BUFFALO, N. Y.—The City Council is considering an ordinance which would compel all steam railroads to equip their roads for electrical operation within the city limits.

BUFFALO, N. Y.—Thirty of the largest real estate dealers in Buffalo have adopted resolutions and have petitioned the State Legislature and Congress for the enactment of legislation that would give the city authority to own and operate a municipal electric-light and power plant. The Real Estate Association asks for the construction of the plant at Niagara Falls.

FAR ROCKAWAY, N. Y.—Steps have been taken by the Business Men's Association and the Property Owners' Association for the installation of an ornamental lighting system on Central Avenue.

FREDONIA, N. Y.—The Niagara & Erie Power Company has submitted a proposal to the Village Council for lighting the streets, which, it is asserted, would mean an annual saving of over $3,000.

GUILFORD, N. Y.—The Standard Light, Heat & Power Company of Unadilla has applied to the Public Service Commission for permission to erect an electric transmission line in the town of Guilford.

HORNELL, N. Y.—The Hornell Electric Company is contemplating the installation of a new street-lighting system to replace the arc lamps now in use.

NEW YORK, N. Y.—The Long Island Railroad Company is planning to equip its Evergreen branch in Brooklyn and Queens Boroughs, about 1½ miles, for electrical operation.

NEW YORK, N. Y.—Permit has been taken out by the New York Telephone Company for the erection of a new five-story exchange building, 100 ft. by 170 ft., on West Thirty-sixth Street, to cost about $500,000. Plans have also been filed for the construction of a new six-story exchange and office building on East 150th Street, to cost about $100,000. A site on Thirtieth and Thirty-first Streets, between Second and Third avenues, has been purchased for a new exchange and office building.

NUNDA, N. Y.—The capital stock of the Nunda Electric Light Company has been increased from $10,000 to $24,000.

PORT JERVIS, N. Y.—The Public Service Commission has authorized the Orange County Public Service Company to take over the Murray Electric Light & Power Company of Monticello, the Port Jervis (N. Y.) Light & Power Company, the Orange County Power Company of Port Jervis, and the Orange County Lighting Company of Middletown, for a consideration of $1,600,000. The new company will issue $600,000 in capital stock and $1,200,000 in bonds.

ROCKWOOD, N. Y.—Plans are being prepared by the Rockwood Manufacturing Company for the construction of a hydroelectric power plant, to cost about $300,000. Donald W. Hyde of Gloversville is president. Rockwood has not a post office.

TOTTENVILLE, N. Y.—Permission has been granted by the War Department to the Richmond Light & Railroad Company for the installation of a submarine cable line in Fresh Kills Creek, from Linoleumville to Rossville, Lake Island. The line will supply electricity to the proposed garbage plant.

UTICA, N. Y.—The Utica Gas & Electric Company has awarded the contract for construction of its hydroelectric power plant, to cost about $700,000, to the Structural Concrete Company of Dayton, Ohio; the contract for water wheels and other electrical equipment was awarded to the Platt Iron Works of Dayton, Ohio.

ENGLEWOOD, N. J.—Bids will be received by the Board of Education until May 15 for construction of the new Lincoln School, on Englewood Avenue, including electrical work, heating and ventilating, etc. Guilbert & Betelle, 665 Broad Street, Newark, are architects.

JERSEY CITY, N. J.—The Board of City Commissioners is contemplating the installation of a new street-lighting system on West Side Avenue, from Montgomery Street to Grant Avenue. The Public Service Electric Company has been asked to submit estimate of cost.

LIVINGSTON, N. J.—An ordinance has been passed providing for creating a lighting district in the township of Livingston.

NEWARK, N. J.—Upon the refusal of the United Supply & Construction Company, 61 Broadway, New York, N. Y., to accept the contract for new boilers and boiler equipment at the Overbrook Hospital, the Board of Freeholders has awarded the contract to Henderson & Company, 835 Springfield Avenue, Irvington, at $63,600.

NEWARK, N. J.—Contract has been awarded by the Higrade Belting & Weaving Company for the construction of a new belting plant, 100 ft. by 200 ft., one story, with engine house and boiler plant, 30 ft. by 50 ft., at 60-76 Frankfort Street, to cost about $25,000. The company has established temporary heaquarters at 671 Broad Street.

PATERSON, N. J.—The Board of Public Works has approved the contract with the Public Service Electric Company for the installation of a new ornamental lighting system on Main Street.

PATERSON, N. J.—Bids will be received by the Board of Education, City Hall, Paterson, until May 14, for construction of Public School 6 on Broadway, including electrical work, heating and ventilating. Henry B. Crosby, First National Bank Building, is architect.

POMPTON, N. J.—Bids will be received by the Board of Education of Pompton Township until May 9 for construction of School No. 6, Bloomingdale, including electrical work and equipment. Van Vlandren & Culver, 140 Market Street, Paterson, are architects.

WEEHAWKEN, N. J.—The Town Council of Union Hill is planning to install a new fire and police signal alarm system, to cost about $23,000. Emil Bautz is town clerk.

ALLENTOWN, PA.—Plans have been prepared for the erection of a power plant at the new leather plant of the Victor Leather Company. Samuel J. Kister is treasurer.

CARLISLE, PA.—Plans are being prepared by E. B. Beetem for the construction of a new power plant to be used in connection with his factory. A. J. Sauer & Company are architects.

EASTON, PA.—The Bell Telephone Company has acquired a site adjoining its local exchange, on which it proposes to erect a seven-story repair and service plant, to be equipped to handle all classes of repair and construction work.

HARRISBURG, PA.—Bids will be received by the Board of Commissioners of Public Grounds and Buildings, Harrisburg, until May 8 for power plant, engineering and laboratory supplies, as well as other equipment for the ensuing year. L. W. Mitchell is secretary.

LEMOYNE, PA. — Extensive improvements are contemplated by the United Electric Company, including the installation of a new turbine, rotary converter and transformer equipment. An addition will be built to the power house. A large part of the machinery, it is understood, has been purchased.

MEADVILLE, PA.—The Northwestern Pennsylvania Railway Company, it is reported, contemplates the construction of an extension from Titusville to Cambridge Springs during the coming summer.

PHILADELPHIA, PA.—The Bell Telephone Company is contemplating the erection of a new telephone building at Fifty-seventh and Chestnut Streets. The cost of the building with equipment is estimated at $400,000.

PHILADELPHIA, PA. — The Electric Service Supplies Company is planning to erect a three-story addition to its plant on Seventeenth Street, to cost about $60,000. Contract for building, it is understood, has been awarded.

PHILADELPHIA, PA.—Plans have been filed by the Schuylkill Forge Company for the erection of a new boiler plant, 35 ft. by 41 ft.

PHILADELPHIA, PA.—Bids, it is reported, are being asked by the Philadelphia Electric Company for the erection of a new substation, 134 ft. by 145 ft., one story, on property recently acquired on Hunting Park Avenue.

QUAKERTOWN, PA.—The Borough Council has approved an ordinance providing for an issue of $45,000 in bonds for the reconstruction of the municipal electric-light plant. A special election will be called to submit the proposal to the voters.

SCRANTON, PA.—Notice has been filed that application will soon be made to Governor Brumbaugh for charters for the following corporations: Sandy Township Electric Company, Brady Township Electric Company, Washington Township Electric Company, Gaskill Township Electric Company, Snyder Township Electric Company, Young Township Electric Company and the Henderson Township Electric Company, each to be located in the township from which it takes its name. Jacob L. Fisher of Punxsutawney is solicitor.

STEELTON, PA.—The Harrisburg Light & Power Company is planning to install a new street-lighting system in Steelton, to replace the lamps now in use.

BALTIMORE, MD.—A permit has been taken out by the Consolidated Gas, Electric Light & Power Company for the erection of its proposed new power plant on Race Street, to cost about $55,000.

INDIANHEAD, MD.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 7, for construction of sulphur storehouse and elevator house, and also a bucket elevator, of the continuous bucket type with buckets secure to single or double sprocket chains, to be driven by an electric motor, at the naval proving grounds at Indianhead, Md. Drawings and specifications (2359) may be obtained on application to the above bureau.

FAIRMONT, W. VA.—Work has begun on the erection of the high-tension transmission line of the Monongahela Valley Traction Company down the Monongahela River to the mines of the Lehigh Coal Company.

SHENANDOAH, VA.—At an election to be held May 8 the proposal to issue $60,000 in bonds for the construction of a dam and hydroelectric plant to supply water, and electricity for lamps and motors in Shenandoah, will be submitted to the voters. The plans provide for a concrete dam and power plant with entire new equipment to develop 350 hp. The present plant is to be held as an auxiliary. E. V. Dunston of Washington, D. C., is engineer.

URBANNA, VA. — The local electric-light plant, owned by J. E. Richwine, was

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

recently destroyed by fire, causing a loss of about $3,500.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until May 2 under proposal 971 for one electric windlass hoisting engine for captive observation balloon. For further information address Charles S. Wallace, major Signal Corps, U. S. A.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 7, for a 20-ton floating crane. Amount available, $30,000. Drawings and specifications (2355) may be obtained on application to the above bureau or commandant of the naval station at New Orleans.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 14, for dry dock pumping plants at the navy yards at Norfolk, Va., and Philadelphia, Pa. Drawings and specifications (2356) can be obtained on application to the above bureau or to the commandants of the navy yards named.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until May 1, under proposal 969, for furnishing one 40-hp. induction motor, one 25-kw. motor-generator set, one 25-kw. generator, one starting compensator and one two-panel switchboard. For further information address Charles S. Wallace, major Signal Corps, U. S. A.

WASHINGTON, D. C. — Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Mare Island, Cal., Schedule 950—one motor-driven wood planer; Schedule 973—miscellaneous steam and water iron pipe fittings. Newport, R. I., Schedule 951—five turbine bulkheads, tail cones, yokes, etc., miscellaneous after bulkhead, valve bodies, etc. Norfolk, Va., Schedule 967—miscellaneous wire steel rope. Washington, D. C., Schedule 990—32,000 ft. plow steel wire. Philadelphia, Pa., Schedule 962—800 lb. soft composition wire, 1000 spiral tube boiler brushes, 20,000 ft. galvanized sheet conduit pipe. Puget Sound, Wash., Schedule 980—miscellaneous bronze phosphor wire, miscellaneous steel crucible wire; Schedule 949—one motor-driven horizontal punch, one motor-driven joggling plate rolls. Portsmouth, N. H., Schedule 998—one motor-driven vertical 10½-in. shaper. Brooklyn, N. Y., Schedule 989—twenty-seven 600 and 1000-cu. ft. open type, motor, blowers; Schedule 958—thirty portable electric drills, 100 portable electric drills; Schedule 954—sixty-three electric heaters. Charleston, S. C., Schedule 962—nine ¼-hp. portable ventilating sets. Norfolk, Va., Schedule 962—twenty-four ¼-hp. portable ventilating sets. Applications for proposal blanks should designate the schedule by number.

North Central States

GRAND RAPIDS, MICH.—A proposal has been submitted by City Engineer Schriver to provide $75,000 in the budget this year to place the municipal wires underground.

NORTH MUSKOGEE, MICH.—The Council has granted the Consumers' Power Company of Jackson a franchise to supply electricity in North Muskogee. A distribution system will be installed this summer.

DAYTON, OHIO.—Property owners and residents on East Second Street, from Jefferson to Madison Street, have petitioned the City Council for the installation of an ornamental lighting system on that thoroughfare. Similar action has been taken by property owners and residents on St. Clair Street and on Fifth Street, from Wilkinson to Perry Street. It is expected that a petition will be presented by the residents on West Fifth Street from Perry Street to the river bridge.

DELPHOS, OHIO.—Plans have been completed for the erection of a power house and substation in Delphos for the Northwestern Ohio Light & Power Company, to cost about $20,000. W. P. Hurd of Van Wert is district manager.

LAKEWOOD, OHIO.—The city of Lakewood, a suburb of Cleveland, has rejected a bid submitted by the Cleveland Electric Illuminating Company for street lighting. The old contract expired on April 1. The city must now invite new bids or install its own plant.

MECHANICSBURG, OHIO.—The Northwestern Ohio Light Company has purchased a site in Mechanicsburg on which it proposes to erect a substation. Energy will be transmitted from the company's plant at Urbana and stepped down for distribution.

SPRINGFIELD, OHIO.—The city officials are considering the extension of the cluster-lamp lighting system on Fountain Avenue to the bridge.

SPRINGFIELD, OHIO. — Preparations are being made by the Elwood Myers Company for the construction of an addition to its plant, 60 ft. by 100 ft., four stories, which will house the electric sign department. Most of the equipment, it is understood, has been purchased.

HICKMAN, KY.—The local electric-light plant, owned by the Public Service Company of Western Kentucky, is reported to have been purchased by the Kentucky Utilities Company of Louisville.

BRAZIL, IND.—Arrangements are being made by the Crawford-McCrimmon Company for increasing the output of its plant in the near future.

FRANKFORT, IND.—Bids will be received at the office of Charles M. Cohee, city clerk, Frankfort, for the city of Frankfort until May 17 for one second-hand turbo-generator set of about 1250-kva. rating, 2300 volts, two-phase, 60 cycles, with condensing outfit, consisting of surface condenser, steam-driven circulating and air pump, etc. For details see proposal columns.

GARY, IND.—Improvements are contemplated by the Gary & Interurban Railroad Company in Gary, including a new substation, additional cars and loops, etc. Charles D. Davidson is receiver.

BELLEVILLE, ILL.—The Modern Auto & Garage Company is planning to erect and equip a garage and machine shop, to cost about $75,000.

CHICAGO, ILL.—Bids will be received by John McGillen, clerk of the Sanitary District of Chicago, 700 South Michigan Avenue, Chicago, until May 17 for furnishing a hydraulic turbine and an alternating-current generator, to be installed in the power house at Lockport. For details see proposal columns.

ROCK ISLAND, ILL.—Plans are being drawn for a central heating plant, to cost about $150,000, for the Rock Island Arsenal. Col. George W. Burr is commandant.

GREEN BAY, WIS.—The Railroad Commission has granted a certificate of convenience to the Green Bay & Eastern Railway Company, which proposes to construct an electric railway from Green Bay through Manitowoc to Sheboygan.

LA CROSSE, WIS.—Plans are being prepared by the Wisconsin-Minnesota Light & Power Company for the construction of a high-tension transmission line from the Wissota hydroelectric plant above Chippewa Falls to La Crosse.

POTOSI, WIS.—The installation of an electric-lighting system in Potosi is under consideration.

ST. PAUL, MINN.—The installation of an ornamental lighting system on University Avenue, from Lexington Avenue to the city limits, a distance of about 3 miles, is under consideration.

DES MOINES, IOWA.—Preliminary plans are being prepared by the Des Moines Electric Company for the erection of a central heating plant.

DYERSVILLE, IOWA.—Plans are being considered by the Eastern Iowa Electric Company for the erection of an electric transmission line, 9 miles long, into the rural district, known as Hickory Valley, to supply electrical service to farmers along the line.

LITTLE ROCK, IOWA —The City Council is considering the question of establishing a municipal electric-light plant.

NEW VIENNA, IOWA.—The Eastern Iowa Electric Company of Dubuque has been granted a franchise to supply electricity in New Vienna. The company will extend its transmission line from Dyersville to this town.

TINGLEY, IOWA.—The Council is considering a proposal submitted by the Mount Ayr (Iowa) Light & Power Company for furnishing electrical service in Tingley.

DUDLEY, MO.—The installation of an electric-lighting system in Dudley is under consideration. It is proposed to secure energy from Poplar Bluff.

RICH HILL, MO.—The installation of new generating equipment in the municipal electric-light plant is under consideration.

ST. JOSEPH, MO.—An election will soon be called to submit to the voters the proposal to issue $172,000 in bonds for extensions and improvements to the municipal electric-light plant.

SPRINGFIELD, MO.—A petition has been filed with the City Council asking that a special election be called to vote on the proposal to issue $400,000 in bonds to establish a municipal electric-light plant.

TURTLE LAKE, N. D.—The Central Power Company has been granted a franchise to supply electricfty in Turtle Lake. The power plant will be located at the John Satterlund Mine and will furnish electricity in Washburn, Turtle Lake, Mercer, McClusky, Denhoff and Goodrich.

WHITE LAKE, S. D.—The proposal to issue $10,000 in bonds for the installation of a municipal electric-light plant will soon be submitted to the voters.

WESSINGTON SPRINGS, S. D.—The municipal electric-light plant was recently destroyed by fire.

BEAVER CITY, NEB.—The City Council is considering the question of issuing $7,000 in bonds for increasing the output of the municipal electric-light plant with a view of establishing a 24-hour service.

GUIDE ROCK, NEB.—Plans are being considered by E. Brogg of Guide Rock for the erection of an electric transmission line from Guide Rock to the city limits of Superior, a distance of 18 miles, and there to connect with the transmission system of the Southern Nebraska Power Company. Mr. Brogg proposes to supply electricity in Guide Rock.

HOLDREDGE, NEB. — Contracts have been secured by the Intermountain Railway, Light & Power Company for supplying electricity in the villages of Loomis and Upland. The company will extend its transmission line from Hildreth to Upland, a distance of 11 miles, and will also erect a line from Holdredge to Loomis, 11 miles long, to supply the service. Electricity will be transmitted at 11,000 volts.

INDIANOLA, NEB. — Bonds to the amount of $11,000 have been voted for the installation of a municipal electric-lighting plant. The present plans provide for the erection of an electric transmission line to McCook to secure energy to operate the system. The town, it is expected, will take over the local plant, operated by F. Plound.

LOOMIS, NEB.—Bonds to the amount of $3,600 have been voted for the installation of an electric-lighting system in Loomis. Energy will be obtained from the plant of the Intermountain Railway, Light & Power Company at Holredge.

SUPERIOR, NEB.—The Southern Nebraska Power Company is planning to build a reinforced concrete dam across the Republican River, about 1½ miles from Superior. A new generator will be installed, which will be connected to the present prime movers, but probably a new turbine will be installed later on. The work, it is expected, will be done this fall. The cost is estimated at about $15,000.

UPLAND, NEB.—At an election held recently the proposal to issue $6,500 in bonds for the installation of a municipal electric-light plant was carried. Energy to operate the system will be purchased from the Intermountain Railway, Light & Power Company of Holdredge.

BAXTER SPRINGS, KAN.—The Council has granted authority to the Empire District Electric Company of Joplin, Mo., to supply electrical service in Baxter Springs.

BISON, KAN.—At an election held recently the proposal to issue $9,000 in bonds to erect an electric transmission line to La Crosse to supply electricity in Bison was defeated.

CANEY, KAN.—The power plant of the Caney Electric Light & Railway was recently damaged by fire, causing a loss of about $25,000. The plant, it is understood, will be rebuilt.

DENTON, KAN.—The City Council is considering the installation of an electrical distributing system in Denton. Energy to operate the system will be obtained over an electric transmission line from Severance.

ELLIS, KAN.—At an election held recently the proposal to issue bonds for improvements to the municipal electric-light plant was carried.

INDEPENDENCE, KAN.—At an election held recently the proposal to issue $75,000 in bonds to establish a municipal electric-light plant was defeated.

IOLA, KAN.—Plans are being considered to extend the municipal electric-lighting service to Colong and Neosha Falls.

IRVING, KAN.—Bonds to the amount of $7,000 have been authorized to erect an electric transmission line to Blue Rapids and to install an electric distribution and lighting system in Irving.

KANSAS CITY, KAN.—The City Commission has decided to replace 500 gas lamps on streets and boulevards with electric lamps.

PRESCOTT, KAN.—The installation of an electric-lighting system in Prescott is under consideration.

STAFFORD, KAN.—The City Council is considering the purchase of a new steam engine for the municipal electric-light plant.

Southern States

BELHAVEN, N. C.—Preparations are being made for the construction of an electric-light plant and water-works system, bids for which have been received. The J. B. McCrary Company of Atlanta, Ga., is engineer and contractor.

CHARLOTTE, N. C.—The Charlotte Knitting Company, recently organized with a capital stock of $125,000, is planning to install 100 knitting machines, to be operated by electricity. The cost of the plant is estimated at $40,000. R. J. Walker is president.

CHAUNCEY, GA.—The town of Chauncey has granted the Georgia & Southern Utilities Company of Eastman a franchise to supply electricity here.

CRAWFORD, GA.—The Crawford Cotton Mills, recently incorporated by B. T. Comer of Crawford, J. W. Ingles of Athens, Ga., and others, have purchased the Edwards Cotton Mill, including the hydroelectric plant at Watson Shoals on Broad River. The new owners contemplate enlarging the mill and expect to erect transmission lines to supply electricity for lamps and motors in Crawford, Comer, Carlton and Lexington.

EASTMAN, GA.—The Georgia & Southern Utilities Company is making extensions to its power plant in Eastman, and, it is reported, contemplates extending its electric transmission line to Chauncey, where it was recently granted a franchise. From Chauncey the line will be extended to Milan.

FOLKSTON, GA.—J. W. Buchanan, who recently built a dam across a creek near the city limits, is planning to erect a power plant for the purpose of supplying electricity in Folkston for lighting the city and for manufacturing purposes.

VALDOSTA, GA.—The South Georgia Power Company, recently organized, is planning to construct a hydroelectric power plant on the Withlacoochee River, 4 miles from Valdosta. Electricity generated at the plant will be transmitted to Valdosta, Quitman, Boston, Thomasville, Pelham, Moultrie and other towns and cities in this section of the State. The company will also supply energy to the Valdosta Street Railway.

JACKSONVILLE, FLA. — The electrical committee of the Board of Bond Trustees is considering a proposition to install a lighting system on the river front.

ONEONTA, ALA.—The Oneonta Utilities Company, recently organized, contemplates the installation of public utility plants in Oneonta.

GULFPORT, MISS.—The contract to supply wire, cables and lamps for the Mississippi Centennial at Gulfport, it is reported, has been awarded to the Electric Supply Company of Memphis, at $35,000. The contract includes 150 lamps and 11 miles of cable, etc.

GREENWOOD, ARK.—The Fort Smith (Ark.) Light & Power Company is contemplating extending its transmission line to Greenwood.

PINE BLUFF, ARK.—The directors of the Pine Bluff school district have awarded the contract for conduit system for electric wiring, including Western Electric interphone system, wiring for fire gongs and class periods in connection with Time System Company's program clocks to the Pine Bluff Electric Company, at $4.800.

OAK GROVE, LA.—Plans are being considered for the installation of a municipal electric-light plant in Oak Grove.

SLIDELL, LA.—A bond issue of $100,000 will be recommended by Mayor Badon, the proceeds to be used for water-works, electric lighting, drainage and another public school building.

BUFFALO, OKLA.—Bonds to the amount of $15,000 have been authorized for extension to the electric-lighting system.

KAW CITY, OKLA.—Contract for construction of the municipal electric-light plant and water-works system has been awarded to Cudgel & McVay of Stillwater. The cost is estimated at about $25,000. The Benham Engineering Company, Colcord Building, Oklahoma City, has charge of the engineering work.

McALESTER, OKLA. — The Pittsburg County Electric Railway Company will install a new engine in its plant to replace the one wrecked by an explosion recently.

OKLAHOMA CITY, OKLA.—Steps have been taken for the installation of an ornamental lighting system on North Broadway, between Grand Avenue and Fourth Street. LeRoy M. Gibbs, secretary of Chamber of Commerce, is interested.

RINGLING, OKLA.—The Consumers' Light & Power Company is contemplating the installation of an electric-light plant in Ringling. C. B. Owens of Chicago, Ill., is engineer.

BEAUMONT, TEX.—Unless more satisfactory rates for electrical service can be obtained from the Beaumont Electric Light & Power Company the Commissioners of Jefferson County may install an electric-light plant to supply electricity for the court house, jail and hospital building.

BOWIE, TEX.—The Wichita Falls (Tex.) Electric Company is contemplating extending its electric transmission lines to Bowie. The company will also supply electricity in Electra, Burkburnett, Iowa Park and Henrietta.

BROWNFIELD, TEX.—Eugene Wood & Company, it is reported, are in the market for equipment for an electric plant for lighting a small town.

CELINA, TEX.—The municipal electric-light and water-works station was recently destroyed by fire, causing a loss of about $20,000. The plant, it is understood, will be rebuilt.

CORPUS CHRISTI, TEX.—The Corpus Christi Railway & Light Company is contemplating the installation of additional equipment in its plant and other improvements to the property.

DALLAS, TEX.—Steps have been taken by property owners on South Ervay Street, from Commerce to Gano Street, for the installation of ornamental lamps. The Park Board, it is said, has authorized the installation of ornamental lamps along the west side of the park, which faces South Avery Street.

HAMLIN, TEX.—The Hamlin Light, Power & Ice Company, recently incorporated with a capital stock og $60,000, is planning to install an electric-light and power plant and ice factory. A. V. Wainwright, R. F. Price and F. A. Matthes are interested.

SAN ANGELO, TEX.—The Interstate Electric Corporation, which was granted a franchise some time ago to construct an electric railway system in San Angelo, will erect its power plant as soon as the necessary machinery and equipment can be obtained.

Pacific and Mountain States

ARLINGTON, WASH.—The Washington Coast Utilities Company of Arlington has petitioned the County Commissioners for a franchise to erect and operate electric transmission lines over certain roads, highways and streets in Snohomish County.

HARRINGTON, WASH.—The Washington Water Power Company of Spokane is planning to install a new electrical distribution system for power and lighting purposes in Harrington.

OLYMPIA, WASH.—The Puget Sound Traction, Light & Power Company of Seattle, it is reported, will begin work immediately on the erection of a 55,000-volt transmission line from Fern Hill to Olympia to connect with the service lines of the Olympia Light & Power Company. The cost is estimated at $53,000. The Olympia company will expend about $15,000 for the installation of new transformers.

SEATTLE, WASH.—The Chicago, Milwaukee & St. Paul Railway Company has announced its intention of equipping its railroad between Othello and Seattle, Wash., for electrical operation, at a cost of about $6,000,000. Substations will be erected at Taunton, Doris, Kittitas, Cle Elum, Hyak, the east portal of the Snoqualmie tunnel, Cedar Falls, Black River Junction and the Tacoma shops, at a cost of $175,000 each. Energy for the main line west of the Cascades will be furnished by the Puget Sound Traction, Light & Power Company, and will be generated at the Snoqualmie Falls plant; from Othello west, power will be purchased from the Washington Water Power Company of Spokane. Energy will also be purchased from the Intermountain Power Company, which will deliver 7500 hp. at Taunton from the Long Lake plant of the Washington Water Power Company, 15 miles west of Spokane.

SPOKANE, WASH. — The Washington Water Power Company is contemplating the erection of a high-tension transmission line from its power plant at Long Lake to Northport, a distance of about 90 miles, to supply electricity to the mines and other industries in that vicinity.

SPOKANE, WASH.—Improvements involving an expenditure of about $100,000 are contemplated by the Jack Waite Mining Company of Spokane. The proposed work will include the installation of a hydroelectric plant to supply energy for milling, mining and transportation operations.

SPOKANE, WASH.—Application has been made to the County Commissioners by the Pacific Power & Light Company of Portland, Ore., for a franchise to erect a high-tension transmission line through Franklin County to connect with the transmission line of the Washington Water Power Company at Lind.

TOUCHET, WASH.—The Pacific Power & Light Company of Portland, Ore., is planning to extend its electric transmission lines from Priest River power plant to Touchet, a distance of 16 miles.

HALFWAY, ORE.—The County Court has granted the Baker Mines Company a franchise to erect an electric transmission line from Halfway to Cornucopia to furnish electricity to operate the machinery at its mines.

MOUNT PLEASANT, ORE.—Arrangements are being made by the Mount Pleasant Community Club for the installation of a street-lighting system in the town.

OSWEGO, ORE.—The contract for the installation of an electric-light plant in Oswego has been awarded to C. O. Knight of Glasgow, Mont., at $7,800.

PORTLAND, ORE.—The City Council is considering a plan of W. H. Daly, commissioner of public utilities, for a steam-driven electric plant to cost about $350,000, preliminary to the development of the proposed hydroelectric development in the Bull Run Reserve.

BLYTHE, CAL.—Application has been made to the State Railroad Commission by the Southern Sierras Power Company of Riverside to extend its electric transmission lines to Blythe, a distance of 90 miles. It is proposed temporarily to generate electricity in Blythe for local consumption, later tying the city in with the company's main line.

CROCKETT, CAL.—The contract for construction of a large water barge for the California & Hawaiian Sugar Refining Company has been awarded to Barney Lanteri of Pittsburgh. A complete electric plant will be installed on the barge. The pumps for handling this cargo will be operated by electricity.

DARWIN, CAL.—Plans are being considered by the Darwin Development Company to build an electric railway along the south shore of Owens Lake, to connect with the Southern Pacific Company at Olancha.

ESCONDIDO, CAL.—Important improvements are contemplated to the local system, recently taken over by the San Diego Consolidated Gas & Electric Company. Arrangements have been made for taking energy from the Escondido Mutual Water Company. The present street-lighting system will be replaced with a modern series system.

FOLSOM, CAL.—Plans have been prepared by the Pacific Gas & Electric Company for the reconstruction of its entire system in Folsom.

OROVILLE, CAL.—Work will soon begin on the reconstruction of the plant of the Pacific Gas & Electric Company at the foot of Huntoon Street. The company will also begin work on the installation of a new street-lighting system in the business district. It is proposed to replace the arc lamps now in use with incandescent lamps.

PASADENA, CAL.—The city of Pasadena is considering building a municipal railway system, to cost about $2,500,000.

ROCKLAND, IDAHO.—Application has been made to the Council by the Idaho Power Company for a franchise to light the streets of the town.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company has extended its electric transmission line from the Wheeler Schoolhouse at Lewiston, a distance of 3½ miles, and will make further extensions to the line to supply electrical service to the residents of Cornish, and will also continue the line to Weston, Idaho, 4 miles distant.

GLOBE, ARIZ.—Surveys are being made for the construction of the proposed railway between Globe and Miami, a distance of 11 miles, to be built by the Globe-Miami Electric Railway Company.

EUREKA, MONT.—A special election will soon be called to submit to the voters the proposal to grant a franchise to supply electricity in Eureka to J. J. Tetrault and associates, who contemplate a hydroelectric development on Grave Creek, to cost about $60,000.

LOVELAND, COL.—Bonds to the amount of $83,000 have been voted for the installation of a municipal electric-light plant.

PUEBLO, COL.—The Arkansas Valley Railway, Light & Power Company is installing a new 2500-kw. motor generator set in its Pueblo power station to facilitate the interchange of current between the Canyon City and Cripple Creek divisions and the Pueblo station.

SANTA FE, N. M.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 18 for repairs to heating, plumbing, conduit and wiring, lighting fixtures, etc., in the United States Court House, etc., at Santa Fe, N. M. For details see proposal columns.

Canada

AYLMER, ONT.—The by-law to authorize $22,000 for remodeling the electrical distribution system and $7,000 for the installation of an electrically-driven fire pump will be submitted to the ratepayers on April 30.

FORT ERIE, ONT.—The Council is considering the installation of an electric-light plant. George Ross of Welland is engineer.

HAMILTON, ONT.—The Standard Underground Cable Company of Canada is erecting an addition to its plant, 120 ft. by 125 ft., to cost about $50,000, for the wire drawing department. Machinery capable of drawing wire, from No. 40 B and S. gage, to the largest size of trolley wire will be installed. All machinery in the new plant will be driven by three-phase, 25-cycle, 550-volt, alternating-current motors. Prack & Perrine of Hamilton are architects.

HILLSDALE, ONT.—A by-law providing $2,500 for the purchase of a gasoline engine and other equipment for an electric plant to light the village of Hillsdale has been approved by the ratepayers.

LONDON, ONT.—The Utilities Commission is considering the installation of an ornamental lighting sytem on Erie Avenue.

OTTAWA, ONT.—The overland pipe system will soon be ready for operation, but it may be allowed to stand idle until the city builds a power plant to operate the same. The Hydro-Electric Power Commission of Ontario recommends the construction of a 2600-hp. plant by the city, which could be increased to 4000 hp. at any time. The commission offers to build the plant and turn it over to the city when completed in one year. The city will endeavor to secure a temporary supply of energy to operate the overland system during the construction of the city plant.

YARMOUTH, ONT.—The Township Council has adopted a resolution authorizing the Hydro-Electric Power Commission of Ontario to submit an estimate of cost of installing an electrical service in the township of Yarmouth between the city of St. Thomas and the village of Belmont.

YORKTON, SASK.—Bids will be received by the town of Yorkton until April 30 for one 350-hp. to 400-hp. combined Diesel engine-driven electric generating unit. Specifications may be obtained at the office of F. J. Pilkington, town clerk.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until May 12, for steel doors, galvanized steel, spring bronze, sheet brass, chain, cable clips, electric cable, magnet wire, compensators, lighting fixtures, electric meters, electric motors, smoothing planer, machine brass couplings, etc. Blanks and further information relating to this circular (No. 1139) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

14,284. SWITCH BOX; Jerome Z. Bayliss and Charles Raus, Cleveland, Ohio. App. filed Sept. 13, 1916. (Reissue.) May be used either as a single unit or as one of a plurality or gang.

14,286. ELECTRIC HEATING PAD; Nelson E. Mann, New Britain, Conn. App. filed Feb. 23, 1917. (Reissue.) Regulating device.

1,222,593. ART OF PRODUCING ALUMINUM CARBIDE; Maurice Barnett and Louis Burgess, New York, N. Y. App. filed Jan. 26, 1917. Carbon is present in an amount in excess of that theoretically necessary to reduce the alumina to metal.

1,222,633. CENTRIFUGAL SWITCH; Carlton L. Kennedy, South Braintree, Mass. App. filed Aug. 1, 1914. For split-phase induction motors.

1,122,637. ELECTROCHEMICAL TREATMENT OF LIQUIDS; Clarence P. Landreth, Philadelphia, Pa. App. filed Aug. 6, 1915. For removing incrustating salts, for softening, for removal of colloidal and suspended matter.

1,222,658. ADVERTISING OR SIGNALING APPARATUS; James P. Naylor, Dulwich, Eng. App. filed April 14, 1914. Capable of reproducing devices, words, phrases, letters or signs in a larger variety and in a larger number of methods.

1,222,669. ELECTRIC BATHTUB HEATER; John W. Purnell, Morristown, Tenn. App. filed May 3, 1916. Carried in a dress-suit case.

1,222,676. ELECTRIC CANDLESTICK; Andrew J. Sanford, Newark, Ohio. App. filed June 24, 1913. Adapted to be used as the standard of an electrolier.

1,222,692. REVERSE-PHASE SAFETY RELAY FOR MOTOR CIRCUITS; Charles H. Spangler, Reading, Pa. App. filed Oct. 5, 1914. For protecting multiphase motor-driven mechanism.

1,222,714. ELECTRIC SWITCH; George Baehr, McKeesport, Pa. App. filed Oct. 29, 1913. Improvements.

1,222,720. AUTOMATIC SWITCH; Joseph Bijur, New York, N. Y. App. filed Nov. 17, 1911. Reversing.

1,222,721. ELECTRICAL CONNECTION; Carl H. Bissell and Elda G. Smith, Syracuse, N. Y. App. filed Jan. 8, 1914. Socket.

1,222,761. OSCILLATOR; Charles D. Herrold, San Jose, Cal. App. filed Oct. 20, 1915. Comprises the necessary number of gaps in a single unit.

1,222,803. RECTIFYING DEVICE; Charles C. Ruprecht, Midway, Fla. App. filed Nov. 25, 1914. Simplified type of vibrating armature rectifier.

1,222,805. GAS GENERATOR; Leo P. Sebille, Providence, R. I. App. filed June 16, 1916. For generating oxygen and hydrogen gas.

1,222,837. PORTABLE ELECTRICAL DEVICE; Elbert R. Winslow and Clyde A. Jones, Kearney, Neb. App. filed March 20, 1916. Electric fan and an electric incandescent light mounted on the same frame.

1,222,852. CONTROLLER FOR AND METHOD OF REGULATING ELECTRIC MOTORS; Harry E. Dey, Jersey City, N. J. App. filed Sept. 29, 1914. For use on electrically propelled vehicles.

1,222,869. MAGNETO; Francis R. Hoyt, East Orange, N. J. App. filed Feb. 15, 1916. Improvements.

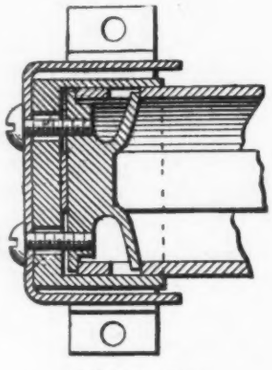
Record of Electrical Patents

Notes on United States Patents issued on April 17, 1917

1,222,885. INDUCTION-COIL CONTROLLER; Mary P. Mitchell, Eaton, Ohio. App. filed Dec. 31, 1915. Prevents an overcharge in the current induced in the secondary.

1,222,886. ELECTRIC SWITCH FOR LAMP SOCKETS, ETC.; Shiras Morris and Monroe Guett, Hartford, Conn. App. filed April 14, 1915. Improvements.

1,222,900. ALTERNATING-CURRENT MAGNET; William S. Smith, Cambridge, Mass. App. filed Sept. 10, 1915. Guide tube for the core, which is so constructed that the heating due to eddy currents is practically eradicated.



1,222,937.—Fuse

1,222,916. IONIZED-CHAMBER DEVICE; Clifford D. Babcock, New York, N. Y. App. filed Oct. 24, 1916. For use as detectors, indicators, amplifiers, repeaters, relays.

1,222,937. FUSE; Albert F. Daum, Pittsburgh, Pa. App. filed May 10, 1913. Refillable fuses.

1,222,945. MEDICAL APPARATUS; Oscar Hammerstein, New York, N. Y. App. filed June 14, 1916. Improvements.

1,222,947. ELECTRIC SWITCH; George H. Hart, West Hartford, Conn. App. filed June 17, 1916. Snap switch which can be operated to make and break a circuit by an oscillating movement of the actuating member.

1,222,952. FUSE DEVICE; Alfred Herz, Chicago, Ill. App. filed Jan. 26, 1911. For operation on overloaded current.

1,222,982. BRUSH AND HOLDER FOR GENERATORS AND MOTORS; John B. Peters, Toledo, Ohio. App. filed Nov. 14, 1913. Embodied in different forms of construction.

1,222,999. COMMUTATOR BRUSH; Henry K. Scandell, Chicago, Ill. App. filed March 20, 1916. Lightens the construction of the brush.

1,223,000. MEANS FOR RECTIFYING ALTERNATING CURRENT FOR EDISON THREE-WIRE DISTRIBUTION SYSTEM; Henry K. Sandell, Chicago, Ill. App. filed April 8, 1916. Accomplished by the use of a rotary rectifier comprising a synchronous motor which drives a rectifying commutator.

1,223,091. METHOD OF MAKING HOLLOW METAL OBJECTS BY ELECTRICAL WELDING; Thomas E. Murray and Harry R. Woodrow, New York, N. Y. App. filed Jan. 24, 1917. Improvement.

1,223,092. ELECTRIC WELDING APPARATUS; Thomas E. Murray, New York, N. Y. App. filed Jan. 29, 1917. Consists of a welding electrode made in sections.

1,223,094. DYNAMO-ELECTRIC MACHINE; Alfons H. Neuland, Bergenfield, N. J. App. filed Feb. 20, 1914. Commutating type.

1,223,095. INDUCTION POWER-TRANSMITTING DEVICE; Alfons H. Neuland, Bergenfield, N. J. App. filed April 16, 1914. Electromagnetic or induction type.

1,223,096. DYNAMO-ELECTRIC MACHINE; Alfons H. Neuland, New York, N. Y. App. filed March 30, 1915. Means for properly spacing and rigidly supporting the field parts.

1,223,111. CONNECTION BOX AND PLUGGING JACK; Henry F. Richardson, New York, N. Y. App. filed Sept. 11, 1914. Safe from short-circuiting and grounding.

1,223,114. ELECTROLYTIC RECTIFIER; Charles C. Ruprecht, Midway, Fla. App. filed April 22, 1916. Improved.

1,223,117. ELECTROTHERMOSTATIC CONTROLLER; Joseph C. Schaf, Jr., and William E. Muck, Indianapolis, Ind. App. filed Sept. 16, 1916. Dial-indicating means.

1,223,169. REMOTE-CONTROL SYSTEM; Charles J. Henschel, Bloomfield, N. J. App. filed March 9, 1914. An operator at one station may exercise positive and accurate control over movable mechanism at another station.

1,223,180. IGNITION SYSTEM; Charles F. Kettering, Dayton, Ohio. App. filed Aug. 11, 1911. Prevents the waste of current.

1,223,224. APPARATUS FOR THE ELECTRICAL TRANSMISSION OF POWER; Herman B. van Daalen and Hugo P. Schreiber, London, England. App. filed Oct. 23, 1912. Dynamo-electric machine having two armatures capable of independent rotation and a single stationary field the intensity of which can be varied as desired.

1,223,278. MULTIPLE-HEARTH ELECTRIC FURNACE; Alois Helfenstein, Vienna, Austria. App. filed June 5, 1914. Allows of an ample charging of the furnace.

1,223,306. ELECTRICAL MEASURING INSTRUMENT; William Anthony, Clyde, Ohio. App. filed Jan. 20, 1916. Pocket voltmeters and ammeters.

1,223,313. ELECTRIC REGULATION; John L. Creveling, New York, N. Y. App. filed June 23, 1910. Improvements.